THE MARINE REVIEW

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An Opportunity for Real Service

Peace Brings to America the Chance to Promote the World's Interest and Her Own by Constructive Legislation on Marine Problems

FOUR years, lacking only two weeks, found the military power of the Germanic alliance still at flood tide. Four months, lacking only one week, found this great war machine accepting gratefully the terms of an armistice which was a confession of complete defeat. The strutting puppet who eight years ago proclaimed his divine right to sovereign power fled secretly to the only haven remaining—the final day's relic of his military power permitting him to reach Holland from the Belgium he had despoiled although this power had fallen so low it could not safeguard his passage through his revolting subjects to Switzerland or Scandinavia. Belgium was the path he chose from choice for his murderous drive on civilization and the path he chose from necessity for his escape from punishment.

The world empire of Wilhelm the Last has shrunk to the confines of a small Dutch estate. Mittel-Europa is measured by the confines of a Hollander's farm. No other autocrat ever fell so far as he of the shriveled arm and perverted brain. The Beast of Berlin has become the Mutt of Middacht.

The Dangers of Delay

Civilization required nearly four years to close the gap between unpreparedness and irresistible power. The advent of peace carries with it none of the outward evidences of a life and death need for haste which have stood out so prominently since August, 1914. Under the surface the necessity for proper haste, correct judgment and united action is still to be found. It is debatable whether the problems of peace shrink when compared with the problems of war. Success, though deferred, met the solution of the military difficulties. Success, without deferment, is required in solving those problems which now hold the front rank.

Each nation of the successful alliance has its own problem, in fact, every nation in the world is entering a critical period where wise action spells the difference between importance and impotence. Reconstruction has a wide range of translation, running from the reconstruction of the government as in Russia and Germany, to the actual physical reconstruction of homes and industries as in Belgium, Serbia and portions of France and Italy, and then to the reconstruction of the industrial life upon a peace-time basis, as in Great Britain and the United States.

The United States cannot drop overnight its interest in world affairs. Our self-centered viewpoint of a few years ago has no place in a world where our comrades in arms are suffering from starvation, without the tools to rebuild the industries which will remove these privations.

Ship Demand—and the Supply

Throughout the United States today a feeling of uncertainty regarding the disposition of many essential war industries prevails. Shipbuilding is such an industry. The action of the shipping board in shutting down on the wooden ship program and its plan to close up inefficient steel shipyards have engendered uncertainty over the ultimate fate of the bulk of the yards. A study of world shipping conditions, a reference to statistics such as those given in these columns last month showing a net ship deficit today of eighteen million deadweight tons, supplies the answer. The analysis presented on the following page shows how far the shipping board's revision may rightfully be expected to extend. Some mushroom yards must go, the necessary correction of our ship program to embrace a balance between large and small ships must be made. The fundamental fact that the world needs ships and will need them for some years answers the question of what will happen to American yards.

The war has revealed the falseness of many former theories. It has taught legislators as well as business men. The reborn American merchant marine must be kept alive and to that end the throttling legislation of prewar days must give way to laws which will foster rather than retard. Congressional wisdom is needed in the full acceptance of those opportunities which are offered by peace.

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What Peace Means to U.S. Shipyards

End of War Spurs Emergency Fleet Corporation to Shift Program—To Concentrate on Larger Steel Vessels

SUBMARINE warfare lost its force some time ago. With its passing the emergency tonnage shortage was met by new construction not only in American but in yards all over the world. Bulgaria, Turkey and Austria withdrew from the war; Germany, accepting the armistice terms dictated by the allies, had to cease fighting.

These rapid events on the battlefield provide the urgency for changes in the plans of shipbuilding by the Emergency Fleet corporation. Peace promises to find the United States possessed of a large fleet of wooden and small steel ships. A deficiency in large steel vessels and in the medium sized steel ships of approximately 15,000 deadweight tons has to be faced. That deficiency must be eliminated if the United States is to assume a prominence in the peace trade of the world.

These conditions have prompted the shipping board to undertake a revision of the entire shipbuilding program. "This revision will affect not only the wooden ships," declared Charles Piez, vice president of the Emergency Fleet corporation, "but the steel and concrete vessels as well. It is brought about partly because of the enormous expense which shipbuilding has placed on the nation and partly because the original program has been found not to be adjusted to the needs of the war."

Need More Big Ships

It is said that the shipping board has found use for but one-half the wooden ships built and under construction, and it was possible to put many of them in trades in but a makeshift fashion. English shipbuilders, it is reported at Washington, even during the most intense emergency gave chief attention to the building of 13,000-ton ships and larger. Vessels of this size have been recognized as the British standard for new construction during the war, inasmuch as operators report that with everything considered a ship of this size can be operated with most economy. No surprise has therefore been occasioned by the report that the shipping board is about convinced that even the 7500 and 8000-ton fabricated vessels building at the big Hog Island yard may be too small to prove economical of operation in the peace trade. A revision of all shipbuilding contracts to specify steel ships exclusively and more ships of not less than 12,000 to 14,000 tons deadweight capacity is the program for which American builders should be preparing themselves.

Officials in Washington have initiated alterations in plans which may be taken as a forerunner of these prospective changes. This change was forewarned by Charles M. Schwab, director general of the Emergency Fleet corporation, in a public address in Milwaukee several weeks in advance and has been talked of privately in Washington for some time. The immediate change means rather the curtailment of yard construction than the curtailment of shipbuilding itself. The largest project so far affected is known as the Alameda, Cal., yards where construction had started and heavy contracts for machine tools had been let. This yard was to build 12,000-ton troopships. It was to be constructed for the government by the Bethlehem Steel Corp. acting as agent. It is estimated that adjustments in this particular case will run to $8,000,000 to $10,000,000.

Other projects abandoned include the main boiler plant which was to be erected near Perth Amboy, N. J., by the Barber Asphalt Paving Co. as a government agent and big extensions to the yards of the New York Shipbuilding Co., Camden, N. J. It will be noted that these were all plant contracts and were chiefly government enterprises.

"Last April," explained E. N. Hurley, chairman of the shipping board, "the military program was so materially enlarged that the war department called on the Emergency Fleet corporation for the construction of 94 transports, totalling over 1,100,000 deadweight tons. The troopship program which the Fleet corporation at that time had undertaken was but a little more than one-half of that total tonnage. A careful survey was made immediately in order to determine which of the old yards could undertake additional construction of this type of ship. It was realized, of course, that these fast and complicated vessels could be constructed only under experienced management and the choice of yards necessarily was confined, therefore, to those which already had built vessels of a similar type.

P. A. S. FRANKLIN

Chairman of Shipping Control Committee, United States Shipping Board, Who Directs the Operation of Government Merchant Ships.

"The Fore River yard, the yard of the Wm. Cramp & Son Ship & Engine Building Co., and the yard of the Newport News Shipbuilding & Dry Dock Co., were so completely loaded up with navy work that they were unavailable for the execution of this additional program. It was, therefore, decided that construction should be undertaken by the New York Shipbuilding Co., the Bethlehem Shipbuilding Co., at Sparrows Point, Md., and a new plant to be constructed adjacent to the Bethlehem shipbuilding yard at Alameda, Cal. The Sparrows Point yard already had been enlarged for the purpose of undertaking construction of vessels of the larger type, and enlargements at the yard of the New York Shipbuilding Co. were authorized so that this plant might undertake a portion, at least, of the additional program.

Government Was to Finance Yard

"The new yard at Alameda was to be created wholly out of government funds, to be owned by the Emergency Fleet corporation, and to be turned over for operation to the Bethlehem company, acting as the superintendent for the Fleet corporation. Contracts were let for the construction of the yard and work begun early in July. Delivery of the vessels from the new yard was expected to begin in 1920.

"Since then, however, the plans for the military campaign abroad have been so intensified that it was realized that no ships which could not be produced in 1919 would be of any particular value in the prosecution of our war program. It also was realized that the construction of the yard at Alameda might temporarily, at least, reduce the output of the several large producing yards in that district and it was thought best, after conference with Director General Schwab, that work on the Liberty plant, as the new Alameda yard was to be called, should stop and that all contracts concluded in connection therewith should be reassigned or cancelled. Orders to this effect were issued by Mr. Schwab, and the Fleet corporation now is engaged in carrying out this order.

"At the same time, certain reductions in the facilities, originally planned in connection with the extensions to the New York Shipbuilding Co.'s yard at Camden, were ordered, and this order is now being carried out.

"The need for cargo vessels at this time is so great and so insistent that it was deemed wise in the interest of speedy production for this type of vessel to curtail all new facilities so that the material and labor released through this curtailment might be

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available in the actual output of ships."

Washington officials are not anticipating any reduction in the tonnage demands of the world, even with peace assured. The present world tonnage is below the peace requirements and construction will continue until this shortage is overcome. The present program of the Emergency Fleet corporation calls for 15,000,000 deadweight tons of merchant ships. American yards have so far finished but one-sixth of this work.

"I can say with frankness," declared Mr. Hurley, "that our shipyards will be kept going to their capacity and they must not let up. Efficient yards will be encouraged, and supported because we can depend upon them to carry out their promises and produce ships economically. The work inefficient yards cannot do will fall to other plants with better facilities."

Wooden Ships Criticized by Federal Committee

(*Special Wire to The Marine Review*)

San Francisco, Nov. 8.—All wooden vessels now on the ways or awaiting engines are to be converted into barges, according to an official announcement made here. This decision follows on the heels of a rapid and effective survey of the seaworthiness of the steamers in this port which is developing the fact that few of them can put to sea without extensive repairs.

The wooden steamers, admittedly built hurriedly and of green timbers, were intended as a supplementary supply fleet for the Atlantic. The BLACKFORD and COOS BAY started on their voyages via the Panama canal but foundered in Mexican waters last September. None of the other wooden steamers have been sent to the Atlantic since. Of the 32 wooden steamships commissioned by the government, seven are in drydock or are undergoing repairs here. Two are being towed to this port from offshore and three are being repaired in the north. The fleet as a whole has been giving considerable trouble.

A committee of shipping men and construction experts, appointed by John G. Rosseter, director of operations of the United States shipping board, and headed by Capt. Charles W. Saunders, superintendent of the Matson Navigation Co., started their exhaustive examination of wooden ships by recommending the condemnation of the steamer MARSHFIELD as unseaworthy. Slack water created by the propellers caused steering trouble and the committee is reported to have decided that the contemplated lengthening of the vessel and other changes might not make the MARSHFIELD of permanent value for long voyages. The builders have decided to go ahead with the alterations when a second inspection will be made. The Rosseter committee expects to spend five weeks in the survey and will report the exact condition of the vessels inspected. Capt. John F. Blain, director of construction for the shipping board in the northwest, where some of the boats undergoing a second inspection were turned out, does not attach blame to the government inspectors who did the work in the first place but says that the steamships are as good as can be built with the material at hand and under high speed construction conditions.

In addition to the two boats which foundered the following wooden steamers appear in the government's record of accidents, rebuildings and repairs: COCONIMO, QUINAULT, BELOIT, ABRIGADA, QUIDNIC, BROMEDA, MAKASKA, WAKAN, NEEOLAH, DACA, KINEO and FORRESTER.

The rapidity with which steel vessels are being turned out is believed to have had some part in the government's decision to convert new wooden hulls into barges.

While government contracts will run on through 1920, there will be nevertheless an easing up in this work. Private shipyards have known all along that this must come and after studying the problem they will undoubtedly be glad to learn that the easing up process will continue over a length of time, thereby making possible a readjustment without an industrial upheaval.

Permanence the Keynote

"What we are striving for now," Mr. Schwab said, "is economy and permanence of production."

"The time has come," continued Mr. Hurley, "when we must begin to ease up. This easing-up process must be applied to steel ships as well as to wooden ones but as the number of wooden ships already completed, added to the number contracted for and which shall be constructed, will fill the demand for ships of that kind, we are curtailing production beyond that point. Therefore, the wooden ship program will be completed by the end of 1919 as we are making no contracts to run into 1920."

A slowing down in the building of steel ships will make possible a redistribution of the steel supply of the country, permit a readier reconstruction of industrial facilities and a replacement of the rolling stock of the railroads. Furthermore it will relieve the labor shortage materially. The shipbuilding yards are now employing some 400,000 workmen and it was estimated that 50,000 more would be needed next year to carry out on time the contracts already let for ship construction.

Sifting Out Inefficient Yards

"In building new shipyards during the emergency of war," said Mr. Hurley, "it is to be expected, in view of the fact that the shipbuilding industry of this country had been reduced to a minimum, that many yards would be started with men of very limited experience in that particular line; and it is also to be expected that many of these men with their inexperience should, in a measure, fail to develop efficient organizations to produce ships promptly and economicly. The officials of the Emergency Fleet now know which yards are building ships at fair prices and those that are not doing so, as well as the yards that are not keeping their promises; and they are prepared to take effective measures to bring about the necessary results."

Inefficient shipyards require labor that might have been more economically used in the efficient yards. Even though all the yards may not receive contracts, the man-power of the yards will be sorely needed for a long time to come.

"With the return of thousands of able-bodied, disciplined and hardened men who were called to the colors," Mr. Hurley points out, "labor problems in the yards will not be so serious. Many of these men will be absorbed back into the mining, transportation, milling and fabricating industries, and their addition to the strength of industrial America will relieve the difficulty that now is experienced in getting materials to the shipbuilders. With the ending of the war we will be assured, therefore, of easier, more efficient operation than during the past, when our difficulties have been so numerous and so perplexing.

"This does not mean that there will be a great reduction of the efficient labor in the yards. The demand for the expert worker will be greater than ever, because the large part of the task of completing our program of ship construction is still before us. More riveters, shipfitters, chippers, caulkers, bolters-up, riggers and draftsmen, foremen and executives will be needed after the war.

"An enormous repair and overhauling activity will spring up in connection with the shipbuilding industry. Our merchant marine will, as a matter of course, suffer from natural depreciation, wear and tear, and inevitable accidents which will give employment to thousands of men in drydocking and repair yards."

An Important Adviser

While it is undoubtedly true that Mr. Hurley assumes full responsibility for the curtailment or the reallocation of the shipbuilding program, whichever it may be called, it must not be forgotten that Mr. Hurley has some advisers, and one especially, to whom must be attributed in part responsibility for this outcome. P. A. S. Franklin, chairman of the shipping control committee, has been the real factor behind the operation end of the American merchant marine. Mr. Franklin was one of the most suc-

(*Concluded on Page* 550)

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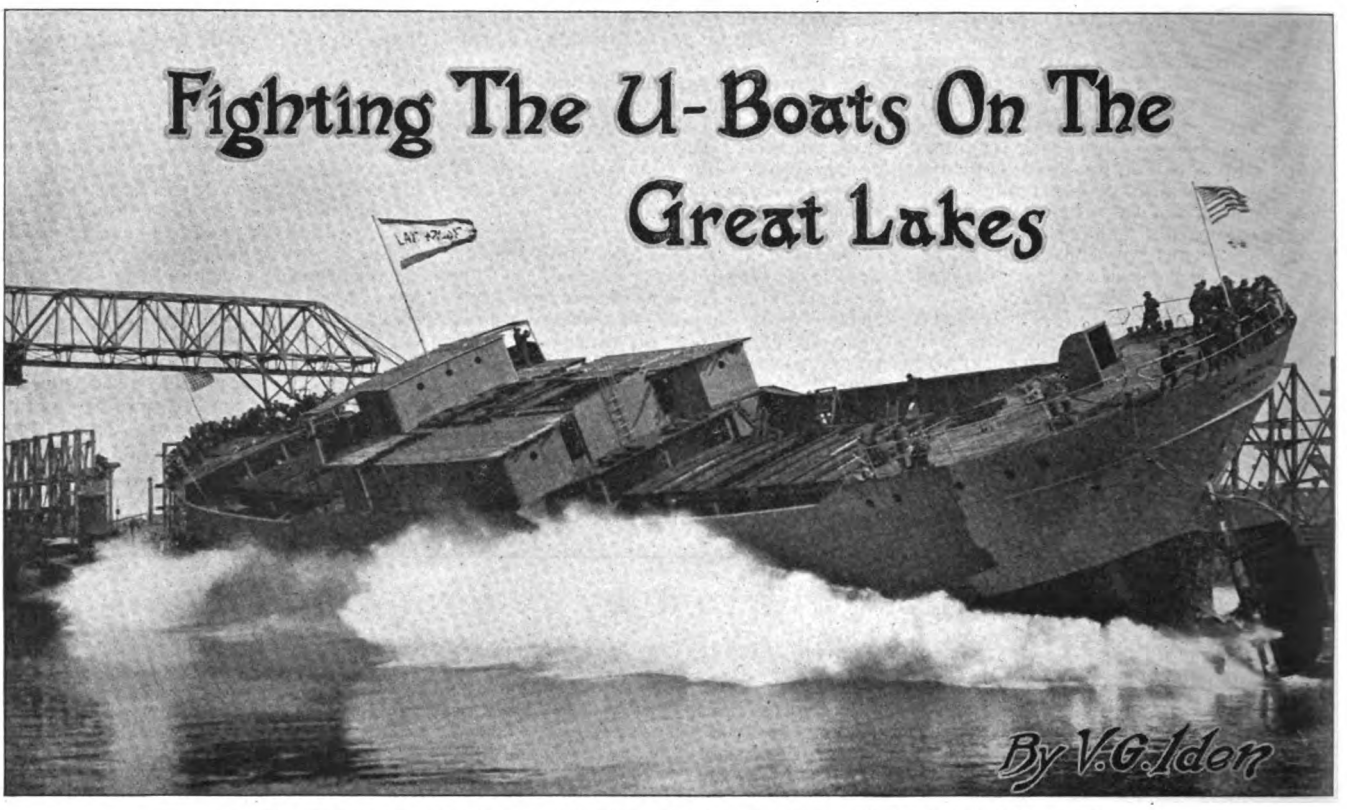
Fighting The U-Boats On The Great Lakes



Launching the Lake Arline from the ways at the Globe shipyard. This sidewise method is typical of Lake practice

ONE-TENTH of the shipyards of the United States have built and delivered for service one-fifth of the total tonnage of ships received by the Emergency Fleet corporation. It is a record of which these yards are justly pround. It is the record of the shipbuilding plants on the Great Lakes, which, although curtailed by the slow delivery of steel, retarded by the need of keeping the big lake fleet in shape, and restricted by the size of the outlet through which the completed ships must pass to reach the ocean, have mustered their supreme strength and energy to one purpose. This great work of the lakes builders will be recorded as one of the important industrial accomplishments of the present war. The Hog Island shipyard is one of the wonders of the war, but the accomplishment of the Great Lakes builders ranks high as a magnificent display of grit, determination and co-operation.

Were the ships anchored prow to stern they would reach for a distance of 9 miles, an imposing exhibition of what the builders on the lakes have contributed to winning the war. These would include only ocean-going vesels equipped and ready for active service on the Atlantic. Launchings do not count in the lake records because in the minds of shipping men, a ship is not a ship until she can put up steam and weigh anchor. Furthermore these 9 miles of ships built on the lakes are practical. All are employed in essential trades. Many are being used today to transport munitions to France. In some respects, these new ships from the lakes are better equipped than many steel vessels built on the coast, especially in the design of their boilers.

With one-tenth of the total American shipbuilding space, the lake yards built one-fifth of the total tonnage delivered to date to the government, loaded them at lake ports and started them to the Atlantic and Europe.

The sight of this vast fleet of small cargo boats should do the heart of William Denman good. It was Mr. Denman, the first chairman of the shipping board, who advanced the idea of building a bridge of ships to Europe to beat the German submarines. This bridge of ships should be composed of small units, it was then said, so that the loss of any one of them would not represent a considerable detriment to the war program. The lake ships are comparatively small, approximately 3,500 deadweight tons, and at the same time they are efficient. The country has gained in that they are operating units of proved economy.

Proving Their Ability

The wonderful record of the lake builders has been lost sight of largely in the maze of statistics and figures which have not always been complete and often confusing. A bungling censorship has probably been responsible, but after a careful survey of the lake region the visible results of a great work are made clear. In the eyes of ocean shippers, the facilities of the Great Lakes have not been given that considration which the lake builders have, during the past 18 months, demonstrated they so justly merit. When ocean freighters or cargo boats were desired, the Pacific coast builders were considered most efficient. When passenger ships and vessels of the higher grade were to be built the Atlantic builders were appealed to. The lake yards were considered competent of building only that type of boat which is practical to haul ore, coal and other bulk freight on fresh water routes.

It required a tangible display of ability during the season of 1918 for the lake builders to disprove such a fallacy. Efficiency was discovered by the shipping board in the lake yards during the previous season. Now the lake builders are planning to double the 1918 output during the coming season. That is an ambitious program, it is true, but one that the practical supervisor of the district has figured out as conservatively possible.

The 508 rivet gangs working in the lake yards have averaged 2290 rivets per gang per week, exceeding by 30 per cent any other shipbuilding district. The ships they built will bring sugar and coffee to Atlantic ports, coal to New England and munitions to Europe.

A report issued by the shipping board the last part of September showed that that were then 84 ways on the Great Lakes for building steel ships for the government, and 14 for building wooden ships. As a matter of fact one wooden shipyard has been projected on the lakes and one ocean-going wooden vessel built, her delivery being retarded by the accidental crippling of her propelling equipment. Wooden shipbuilding on the lakes is a decidedly questionable venture. It is like trying to discover other fuels in a coal mine. The lakes are in the center of the iron ore and steel-making district of the country, one of the wealthiest steel districts of the world. The forest reserves have

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been largely consumed for some years.

The 14 wooden shipbuilding ways are purely negligible as a source of supply for ocean tonnage. But all of the 84 ways for steel shipbuilding on the lakes are not adapted for cargo ship construction. Many of them are too small. They are being used for the building of tugs and other small craft. Only 78 ways are used for the construction of steel cargo ships for the government. But accepting the shipping board's figures of 84 steel ways on the lakes, a comparison can be made fairly with 810 ways indicated as completed in the whole United States and available for building ships. Roughly, then, the lake yards represented one-tenth of the shipbuilding capacity in the United States available for merchant ship construction.

The American Shipbuilding Co. has been operating 35 ways in its half-dozen yards; 6 at Chicago, 10 at Detroit, 3 at Cleveland, 5 at Superior, Wis., 8 at Lorain, O., and 3 at its Buffalo yards. The Great Lakes Engineering Works has 11 ways: Eight at Ecorse, Mich., and 3 at Ashtabula, O. The Toledo Shipbuilding Co. operates 6 ways at Toledo. The Globe Shipbuilding Co. operates 5 ways at Superior, Wis. The Saginaw Shipbuilding Co. operates 6 ways at Saginaw, Mich. The Manitowoc Shipbuilding Co. operates 6 ways at Manitowoc, Wis., and the McDougall-Duluth Co. operates 9 ways at Duluth. These seven companies with their 78 ways comprise the total equipment of the Great Lakes district for building steel cargo ships. It was from these 78 ways that one-fifth of the total completed deadweight tonnage of ships came that have been delivered so far to the Emergency Fleet corporation.

Size is Arbitrary

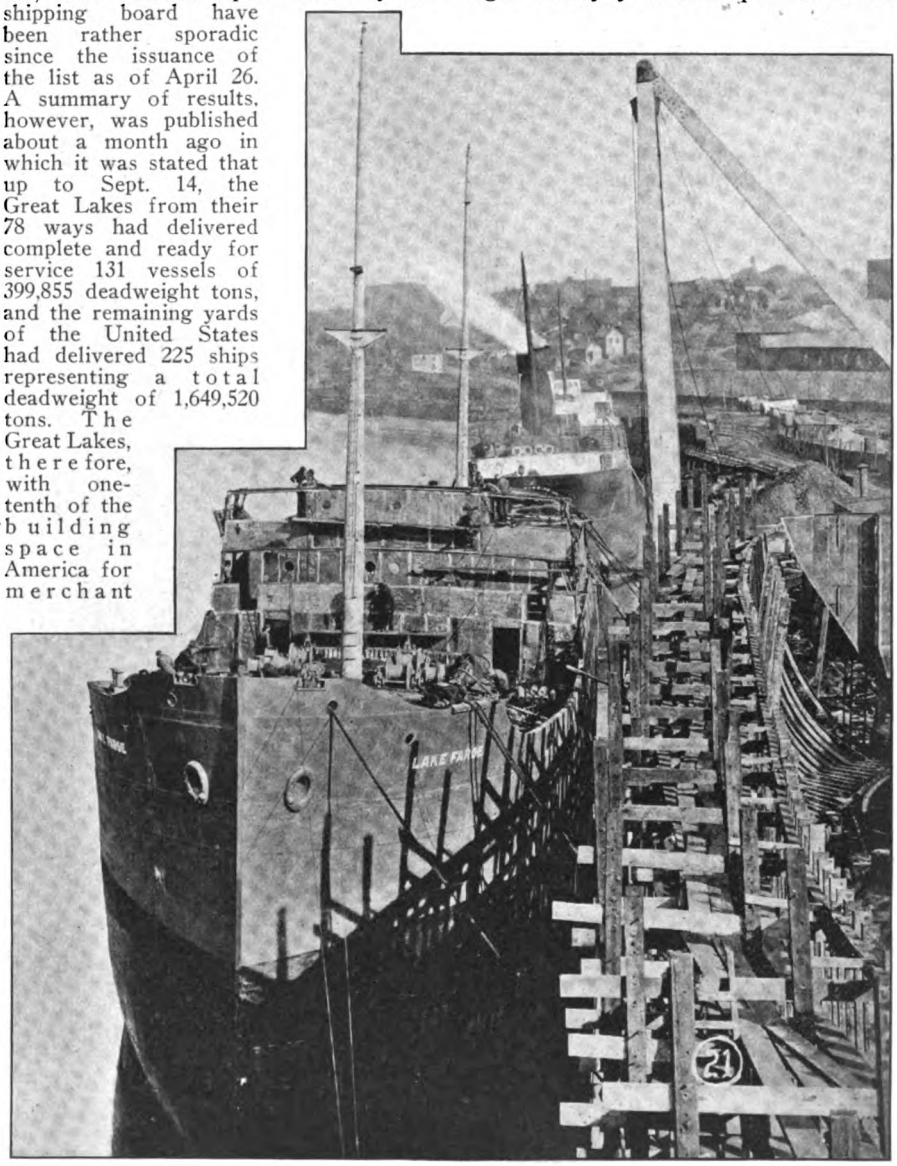
When the government began its search for suitable ocean tonnage the size of the vessels which could be built on the lakes was fixed by the Welland canal dimensions. This was 261 feet over all length, and 43 feet 6 inches molded beam. In the vessels requisitioned the molded depth varied from 20 feet 6 inches to 24 feet. The deadweight varied from about 3000 tons to 3500 tons, according to depth and to some extent to fineness. All of the ships contracted for by the Emergency Fleet corporation on the lakes have been of 3500 to 4200 tons deadweight, the length and beam remaining practically the same and the depths increasing up to 28 feet 2½ inches.

From these lake yards the government will have accepted deliveries of 162 ships of a total deadweight of 567,000 tons up to Dec. 1, 1918. This is mentioned as an accomplishment, since at this writing the navigation season is within a few weeks of closing. This total for the season includes only such deliveries as the supervisor of the district knows from practical experience and actual count will be accomplished. The figure does not include the vessels launched but not equipped. Such vessels as are launched but not delivered in time to get out before ice closes navigation will be fitted out and included in the first of the 1919 deliveries. The record for the season of 1917 was considered good although only 27 ships were delivered to the government. It was during this season that the government's program was put into effect, and the record made by the lake yards prompted the shipping board to give them more consideration. As a result of this, the Emergency Fleet corporation has let contracts for a total of 445 steel cargo ships on the lakes rpresenting about 1,702,550 deadweight tons. In addition to the 162 ships delivered during the season just closed the lake yards delivered three tugs under contract. The plans for 1919 call for the delivery of 283 cargo ships of the standard size built on the lakes and 89 tugs.

By April 26, 1918, the American Shipbuilding Co., Cleveland, had delivered to the government 22 ships representing a total deadweight of 89,200 tons. This list included two lake steamers, the LOUIS W. HILL and the CARMI A. THOMPSON, both 12,500 tons deadweight ships. The remaining 20 ships were, however, chiefly standardized vessels of 3100 deadweight tons, the keels of which were laid in September, 1917. Official reports made by the shipping board have been rather sporadic since the issuance of the list as of April 26. A summary of results, however, was published about a month ago in which it was stated that up to Sept. 14, the Great Lakes from their 78 ways had delivered complete and ready for service 131 vessels of 399,855 deadweight tons, and the remaining yards of the United States had delivered 225 ships representing a total deadweight of 1,649,520 tons. The Great Lakes, therefore, with one-tenth of the building space in America for merchant ship construction had delivered one-fifth of the total deadweight tonnage of ships received by the government up to that date.

In the number of vessels delivered the lake yards have been setting a splendid record. Their preponderance in the number of deliveries was first noted in June and it has grown to considerable proportions during the past four months. For instance, a high officer of the Emergency Fleet corporation states that the lake yards delivered 52.5 per cent of the total number of steel ships which the government received from all the yards of the country during October, and that they delivered 33 per cent in June, 50 per cent of the total number of ships during July, 55 per cent during August and 52 per cent during September—a record of one-half and more of the total American deliveries for four successive months. All the ships completed during October were delivered on an average of 87 days in advance of their contract. One of these October vessels was delivered nearly one year in advance of contract.

Every American yard concentrated its attention upon the July 4 launchings. Every yard attempted to make



SPEED IN LAUNCHING IS SUPPLEMENTED WITH SPEED IN EQUIPPING VESSELS ON THE LAKES. BUILDING SHIP No. 481 AT THE CLEVELAND YARD OF THE AMERICAN SHIPBUILDING CO.

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a record for that day. Therefore it was but reasonable to expect considerable rivalry and consequently a substantial tonnage built that month. Despite this competition, the yards on the lakes came off the victors. Charles Piez, vice president and general manager of the Emergency Fleet corporation, gave them due credit.

"The July standing of the districts," said Mr. Piez, "on the basis of percentage of assigned task accomplished, shows the Great Lakes district leading by 25 per cent, with the California district and the northwest district next in line. The New York district, the Baltimore and Philadelphia districts follow with shrinking percentages, while the fabricated yards, New England, the South Atlantic and the Gulf yards succeeded in the order named."

Many other isolated evidences of acknowledgement of the accomplishment of the lake builders are given in official reports. The shipping board only recently announced that of the five contract steel ships of 28,250 deadweight tons delivered during the week ended Oct. 18, the lake yards contributed three ships with a deadweight total of 10,650 tons. It may not have been intentional, but it is nevertheless a fact that the wonderful record made by the lake builders has been lost sight of in the maze of statistics and publicity given to the shipbuilding problem in the United States.

The good showing for the lake yards was possible through the hearty co-operation of all the builders with the agents of the government supervising the shipbuilding district. Henry Penton, a marine architect of considerable experience, is the head of this district as the representative of the Emergency Fleet corporation. He has adopted some heroic measures to carry out the contracts placed on the lakes. Confronted with limited fitting-out dock facilities, Mr. Penton took over all the drydocks on the lakes in order to hold deliveries at a record-setting pace.

To take over the drydocks and use them in conjunction with the shipbuilding operations necesitated providing other facilities for repairing the going lake fleet. This fleet is engaged in one of the most important war trades, and the lake yards were compelled to handle repair work with great speed and in conjunction with new construction. The lake fleet is the largest and most important domestic fleet in the world. It transports by water 85 per cent of all the iron ore the United States uses—all of the ore going into war products. The 1917 ore movement on the lakes was 62,498,901 gross tons and the 1918 movement will match this huge total. Out of this ore, is being made nine-tenths of the ships, the guns, munitions, rails, locomotives, cars and other articles essential to the prosecution of the war and to the carrying on of commerce. In addition, the lake fleet moved 31,192,603 net tons of coal in 1917, and about 32,000,000 during the 1918 season. This coal was used to run the munition plants and other essential factories of the northwest. The east would starve without the grain that is moved annually by the lake fleet from the west and northwest, which alone approximates 7,500,000 gross tons a year.

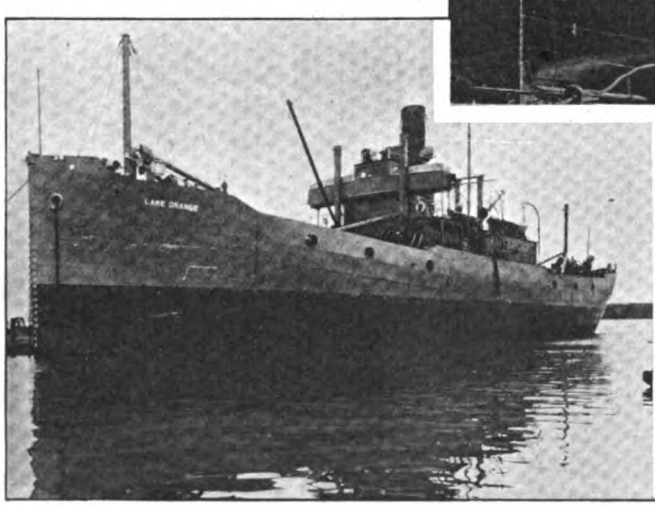
America's Industrial Center

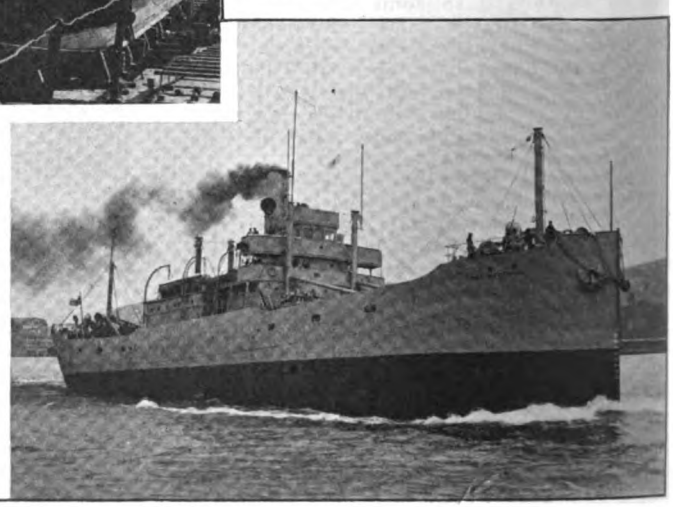
It might with truth be said that the heart of the industry of the United States and the heart of the war is located in the lakes district. Remembering that, the importance of the lake fleet becomes more apparent. The lake shipbuilders were compelled to keep this large lake fleet in good repair, but the repairs must be carried on with as little interference as possible with new ship construction. Builders, owners, shippers and corporation officers worked together as one man to get the maximum service out of yards and ships. No construction facilities were allowed to be diverted to other than absolutely necessary repairs, and, on the other hand, owners and shippers cheerfully waived requirements where that was at all possible.

Such an enviable record of deliveries, and rapid deliveries at that, has been possible on the lakes in part because of the unsurpassed marine engine building facilities in the immediate neighborhood. Within this district are located some of the older engine builders of the country, plants that were ready to turn their output immediately to the account of the government. It has been estimated that the production of marine engines and auxiliaries in the lake district is easily double that of the requirements of the lake yards. A large part of this output is being supplied to the shipbuilding yards on the Gulf and the Atlantic coast. Lake builders have not been receiving propelling machinery from outside the district with the exception of one builder and then for but a few ships.

The machinery provided for these vessels is of the most approved type. Experiences of war have not made it necessary to adopt substitutes. Except in the case of two ships delivered in 1917, which were equipped with twin screw heavy oil engines, all of the cargo boats built on the lakes for the government are fitted with triple expansion engines. With the exception of one builder, all of these ships also have Scotch boilers. The water-tube boiler is not a favorite in the mercantile marine, but as an emergency measure, it is understood, the Emergency Fleet corporation is fitting them in a considerable number of ships built on the coast.

Ship deliveries might have been much better had the yards been supplied with an ample quantity of steel. For most of the season, it was no unusual thing to have six ways unoccupied at one time because of the steel shortage. For some weeks, 13 ways were idle. To keep the present yards on the lakes working to capacity would have required the delivery of 8475 tons of steel per day. As a matter of fact the average deliveries were under this to such an





EVERY EFFORT IS USED TO SPEED THE VESSELS UPON THEIR INITIAL VOYAGE. ABOVE, GRAYCROFT, BUILT BY THE GREAT LAKES ENGINEERING WORKS. LEFT, LAKE ORANGE, BUILT BY THE SAGINAW SHIPBUILDING CO. RIGHT, LAKE MEDFORD, BUILT BY THE GLOBE SHIPBUILDING CO.

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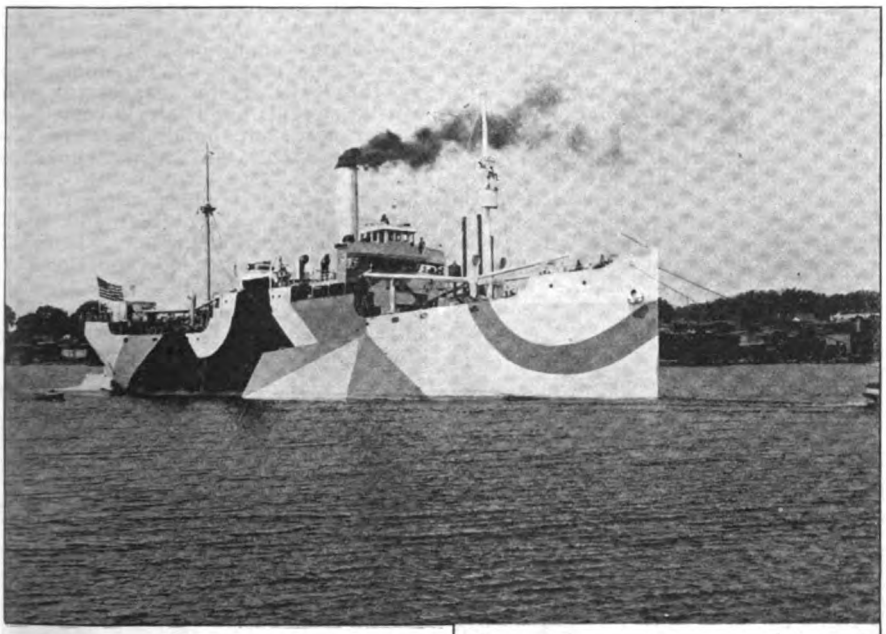
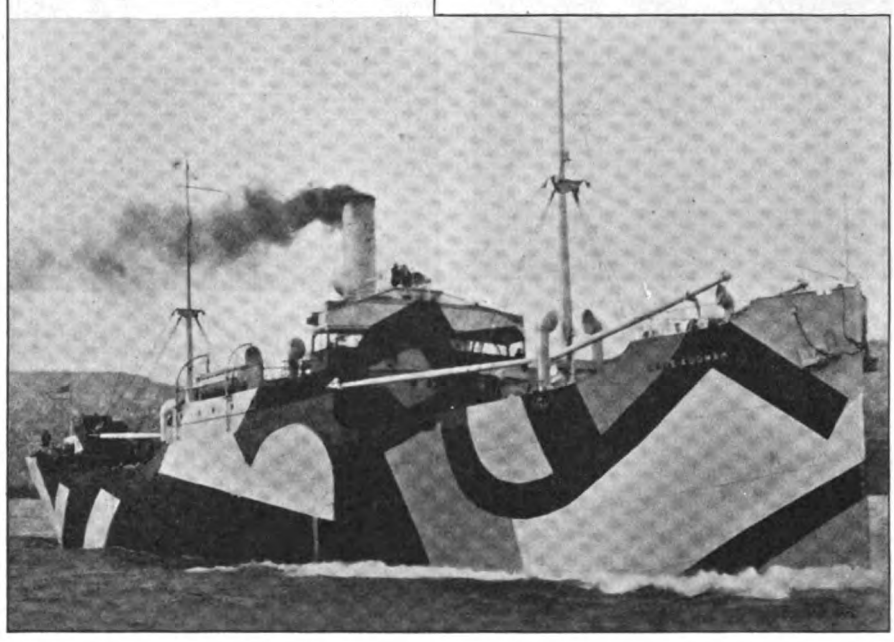
extent as to reduce the season's possible output by 20 per cent. Had an ample supply of steel been shipped to the lake yards during the 1918 season, the deliveries would have been increased by 25 or 30 ships.

The record made is nevertheless of such outstanding prominence that it is but reasonable to be curious how it was brought about with the limited yard facilities offered. The answer is found in the hearty co-operation from the supervising heads down to the men who drove the rivets. The yards and their various executives co-operated with their men and with the supervisor, and because of this uniform harmony the work was carried along quietly and successfully. For instance, it is shown upon examination that the average gang of riveters in the lake yards working an 8-hour day drives 416 rivets. This average rivet drive is 30 per cent greater than the average rivet drive in the next most efficient shipbuilding district.





Lake ships now load direct for Europe. Above, Lake Pachuta, built at Saginaw, Mich. At right, Lake Agomak, leaving Superior at head of 1000-mile lake waterway.

The result is that the lakes hold the record for fast ship construction. But 34 calendar days elapsed between the keel laying and the delivery of the 3500 deadweight ton steel freighter, CRAWL KEYS. This world's record was made by the Great Lakes Engineering Works, Ecorse, Mich. The keel of the CRAWL KEYS was laid on July 11. The vessel was launched in the record-breaking time of 16 calendar days or 14 working days. On Aug. 13 the CRAWL KEYS was completed and on the following day she was accepted and placed in commission. Details of this performance were given in THE MARINE REVIEW, October, 1918.

On the Atlantic coast, the record is held by the New York Shipbuilding Corp., Camden, N. J., which built the 5500-ton collier, TUCKAHOE, in 37 calendar days. On the Pacific, the record is held by the Skinner & Eddy Corp., Seattle, which built the WEST LIANGA, an 8543-ton freighter, in 78 calendar days. The American Shipbuilding Co. at its Cleveland yard built the LAKE NARKA, a 3530-ton freighter, in 84 calendar days.

While the CRAWL KEYS established a record for swift construction, there have been many other rapid launchings on the lakes. The Manitowoc Shipbuilding Co., Manitowoc, Wis., launched the 3400-ton steel freighter, CORSICANA, within 28 calendar days after keel laying. The LAKE NARKA was launched within 46 days after keel laying.

The lake yards worked an average of 508 rivet gangs during the season, and the average drive per gang per week was 2790 rivets. The middle Atlantic district riveters came next with an average of 1575 rivets driven per gang per representative week. The average drive per gang for the northern Atlantic district was 1500 rivets per week; for the northern Pacific district, 1340 rivets; for the Delaware River district, 1160; for the southern Pacific district, 1090; for the southern Atlantic district, 1010; for the Gulf district, 950; and for the fabricating yards, the average was 960 rivets per week per gang.

It is easily seen that the lead in production which was taken by the lake yards this year was due largely to the rapid work of the riveters. In the lake yards, a total of but 508 gangs were at work on the average throughout the season. The representative employment on the Atlantic coast was 997 gangs. On the Pacific coast 2003 gangs were at work. The employment in the fabricating yards is put at 885 gangs, a force much larger than that employed on the lakes.

These statistics give mute evidence of the excellent spirit of the shipbuilders on the lakes. Both executive and employes have been fired by the desire to carry out their part of the war burden and their success is evidenced by the record they have made. They are largely responsible for that great increase in cargo space which during the past month or two has been turned over to the government, a cargo space that will not only help to win unconditional surrender from the Germans but also help to feed the war workers at home.

Of these ships built on the Great Lakes this year one-third are being used in the overseas trade. For the first time in history, ships are being loaded with overseas freight at the lake ports. All of these new ships will take on a part of their cargoes at the lake ports thereby saving the freight to the Atlantic terminal and incidentally relieve the congestion at the Atlantic ports. The depth of the Welland and the St. Lawrence river canals limits the amount of any cargo that may be loaded, and the ships can go through only 50 per cent full. The remainder of the cargo is taken aboard at Montreal. The overseas cargoes loaded at the lake ports include shells and other miscellaneous supplies required in the European war zone.

The loading of these boats directly at the lake ports presented a new

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problem. The lakes did not have the experience in stevedoring or in packing such as is requisite for the overseas trade, having heretofore to deal almost exclusively with the bulk cargoes common to the lakes and with packing for fresh water transit. It was necessary therefore to begin at the bottom, employ a new form of labor and educate the necessary executives to handle them. So proficient has this branch of the work been handled during the season just closing that the stevedores on the lakes have made a record which, it has been claimed, exceeds the record of stevedoring on the Atlantic coast. Whereas the average for the Atlantic is the loading of 15 tons of cargo per gang per hour, the stevedores on the lakes have increased their efficiency so that they have been capable of loading 25 tons per gang per hour.

Such items as these, while of course small in comparison to the aggregate overseas tonnage required by the belligerent governments, have been of great aid. Loading 50 ships on the lakes to 50 per cent of their capacity is the same as loading 25 ships to capacity, and upon all of this freight the rail rates to the Atlantic might be said to have been saved. This loading of overseas cargoes on new ships at the lake ports has contributed to the reduction in freight car congestion at eastern terminals.

Built Many Coal Carriers

Out of the total number of ships built on the lakes this year, two-thirds are being used in the coastwise trade on the Atlantic. Many of these are carrying coal in which trade there is such an urgent demand. A number of the ships built on the lakes have already been placed in that service and are showing excellent results. Others, it has been learned, are intended to be placed in trade with the West Indies. In this trade the ships will bring sugar and coffee to American ports. None of them is equipped for carrying fruits, inasmuch as the refrigeration plants are lacking. Nevertheless they should prove of inestimable service to the breakfast table of the American citizen by adding to the tonnage available for the sugar and coffee trades.

How the Ships Reach the Sea

Many artificial waterways are required to float ships through the canals out of the lakes into the Atlantic. Montreal is at the head of ocean navigation, but Montreal is 1003 statute miles from Belle Isle at the mouth of the St. Lawrence river. From Montreal to Chicago is 1240 miles. The greater difficulty is encountered when leaving Lake Erie. To reach Lake Ontario it is necessary to pass through the Welland canal which is approximately 27 miles long, or more than one-half the length of the Panama canal. After gaining the lower level bevond the Niagara Falls, and crossing Lake Ontario, a series of canals must be passed in order to avoid the many rapids in the St. Lawrence river. The locks in these river canals are equal or greater in size than the locks in the Welland canal, so that the measure has always been spoken of as the size of ship that can navigate the Welland.

A vessel passing from Lake Superior to Montreal, for instance, must navigate 74 miles of canals, which have a total lockage of 553¼ feet. They are 50 per cent greater in length and the lockage three times as high as that of the Panama canal. To reach the sea from head of the lakes a vessel must pass 48 locks. The minimum dimensions of the locks between Lake Erie and Montreal are 270 feet in length, 45 feet in width, and the depth of water on the sills is 14 feet. Vessels accommodated with safety are 261 feet overall length, and, loaded with 50 per cent of their cargoes, draw 13 feet of water.

These canals from Lake Erie to Montreal are all Canadian property. The Dominion government was engaged in enlarging the canals when the war broke out and work quickly stopped. Considerable work had been done on the new Welland canal but this is now waiting the restoration of normal conditions. It was suggested that in view of the dimensions of the locks of the canals the lake yards should build steel vessels of larger size but build them in two parts so that the canals could be navigated. This would, of course, have required a more extensive assembly plant at Montreal and probably other yards further down the St. Lawrence river to put the two halves together. Had this recommendation been adopted by the Emergency Fleet corporation, the lake yards would have been able to show a much larger tonnage of construction than they have. The suggestion, however, was not approved and the yards were directed by the government to proceed with the building of the small standard steel freighter.

Ships Cut In Two

Vessels for lake service are not well adapted to the ocean trades. These vessels are built primarily for transporting ore, coal, grain and similar bulk cargoes. They are much longer than the ordinary ocean steamer of the same capacity and structurally are not designed to meet the strains imposed when caught in the trough of ocean waves during a heavy storm. However, a number of small ships have been in use on the lakes which have proved their adequacy on the ocean. Many of these ships were too long to pass through the Welland canal. To overcome that difficulty, the shipping board developed the idea of cutting them in

M. E. FARR

As President of the American Shipbuilding Co., he is an outstanding figure in the lakes' record of quantity production

JOHN R. RUSSELL

President of Great Lakes Engineering Works, whose company set a world's record by delivering a ship in 29 days

A. MILLER McDOUGALL

General manager of McDougall-Duluth Co., one of the new lake companies which quickly reached an efficient production basis

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two, putting them through the canals, and joining them together at Montreal.

This plan was followed with such success that in 1917 a total of 22 available steamers on the lakes were cut in two, taken through the canals, and then placed together for service on the Atlantic. The navigation season on the lakes closed before the work could be completed, although some interesting accounts are told of the heroic endeavors made to break through the ice. During the 1918 season, 12 more of these lake boats were cut in two and taken to the Atlantic seaboard. These 12 ships represented the total remaining on the lakes which were deemed suitable for conditions on the Atlantic.

While much ingenuity was displayed last year in breaking the ice to get one more ship through, even greater ingenuity is being displayed this year in floating through the largest boat taken over by the government, the VAN HISE, which is not only too long but also too wide to go through the locks of the canals. In this instance the halves of the boat were turned sidewise, after large tanks were built to give the halves stability in this position.

Of the 12 lake boats cut in two in 1918 and taken to the Atlantic, 11 are intended for the transatlantic service, and one large lake ship for carrying coal. The work put on these vessels was considerable. Use was made of the existing hulls, engines and boilers which, when overhauled and repaired, were practically as good as new, inasmuch as all damaged material was replaced.

In order not to interfere with new construction on the lakes, the vessels were reconstructed in small repair yards. One of these existed only on paper when the work began and all of them had to be enormously increased in facilities to accomplish the task. F. A. Eustis has had charge of the acquisition, cutting and removal of the vessels from the Great Lakes to the sea.

This task has been entirely separate from the building of new ocean freighters on the lakes, but the account of the one would be incomplete without some mention of the other. The removal of these boats required not only materials and yard space but also required the services of practical shipbuilders. It was no job for the novice, but a skilled work for experienced men. To that extent the work has detracted from the building of new ships despite the efforts expended to accomplish the other effect. However, the services of yards not suitable for large construction work have been utilized.

It is only fair to acknowledge that the record of shipbuilding on the lakes is in part due to the misfortune of the builders on the coasts. Labor troubles have played no small part in this situation. At one time during the year the labor turnover in the Delaware region, for instance, was extremely large. Another time, as was recorded with much display in the daily press, it was reported that there was considerable loafing in these yards. That condition gave rise to the assertion that many slackers had entered the Atlantic coast yards. The report gained such momentum that the senate commerce committee was for a time prompted to resume its investigation into the shipbuilding problem.

On both the Atlantic and the Pacific coasts much attention has been given to the building of new yards, inasmuch as practically all of the old experienced yards were filled with contracts to build navy vessels. The building of new yards required a different type of labor from that required to build ships. In building these new yards on the coast the pay-rolls have been filled with men experienced in ground construction work. When the yards were ready to build ships, it was necessary to let much of this labor go and enter the market and employ a different kind of labor. At that time practical shipbuilders were very scarce. Many of

(*Concluded on page* 550)

Story of the Great Lakes District

The Bridge---Nine Solid Miles of Ships

By Henry Penton, District Manager
Emergency Fleet Corporation, Great Lakes District

There isn't much to say. It couldn't turn out any other way. The builders of the district are neither amateurs, promoters nor profiteers—just 24-hour a day hustlers. Every one of them knows his business and from the beginning we just all said, "Here's our job, let's go to it."

The builders have never asked for any help of any kind, financial or otherwise. They are all financially well entrenched and most of them were strong years ago. They have made my life a burden in one respect only—steel. They said, "Get us the steel and leave us alone and we will give you the ships." And they did—even without the steel. The production of the district is far below where it would have been but for shortage of steel—20 to 25 ships at least.

As for efficiency, it's old stuff—we invented it years ago. All these so-called records you are hearing about these days were in the discard here years before the United States ever thought about a shipping board. One concern here about a year ago decided to build itself a complete, new plant. Within a year from the time it reached this decision it built its plant and delivered to us therefrom seven complete ships, and this entirely independent of its old plant. That is merely typical of the determination underlying the whole program.

The district leads any and all others from any point of view, number of ships, tonnage, rivet output, tonnage per man, speed of construction or anything else.

I know ships, fore and aft, athwartship and inside out, from the drawing table to the shops; to the fitting out berth, and to the long watch at sea. I have seen them come and go; behave and misbehave. We have grown together, worked together, fought each other and fought together. There is not an unfamiliar step in their entire construction. So why, when this is joined to a life-long, intimate and agreeable acquaintance with a group of he-men, shouldn't the team pull together? It did and there's the result—nine solid miles of ships in a year. And but for that canal system—and steel—it might just as easily have been far more.

No small share of the credit for maintenance of cordial relations and for the satisfactory arrangement of details in accepting deliveries belongs to Assistant District Manager R. W. England whose wide acquaintance, high reputation as a vessel master and operator and sterling integrity extend over the entire district and beyond.

Full recognition should be given to the fact that the district staff, including representatives at the various yards, is of a very high order. It includes a number of men who have achieved prominence as executives in their special and allied activities and who in many cases have given up highly remunerative dutics to associate themselves with the district manager. These features are the outgrowth of long previous intimacy and mutual respect and a whole-hearted enthusiasm. I do not believe that anywhere in the United States is such a staff to be found. Office hours or work mean nothing whatever—results are the only consideration.

Another feature that is worthy of note I think is the extent of the district, which now includes Montreal on the east and west to the head of Lake Superior and Lake Michigan as to ship construction, and far beyond, both west and south, in production of material. The included area is by far the greatest of any district and involves a constant intimacy with plants separated by distances unknown to other district offices and unrealized by all except a few.

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Model Ships Give Resistance Data

Four 20-Foot Models Were Used Which Corresponded to 400-Foot Cargo Ships—Investigation Covers Wide Scope

By William McEntee, U. S. N.

PREVIOUS experiments made at the United States experimental model basin indicate that for slow ships of full lines, such as are used for the ordinary single-screw cargo ship, it is desirable to use a certain amount of parallel middle body. In those experiments the different models used had varying lengths of parallel middle body distributed equally forward and abaft the midship section. The present investigation had for its object the determination of the best fore and aft position for the parallel part of the ship, and the investigation of the effect of this variation on the shaft horsepower, propulsive coefficient, and wake and thrust deduction factors.

Four 20-foot models were made corresponding to ships of 400 feet length between perpendiculars and of 57.3 feet beam, 26 feet draft, and 13,137 tons displacement when fully loaded. A longitudinal or prismatic coefficient of 0.788 was chosen as representing about the present practice in cargo carriers of this type. A constant length of the parallel middle body was taken equal to 33 per cent of the ship's length. This percentage was found in the investigations referred to above to give about the minimum residuary resistance for the speeds attained in practice for ships of this type.

In Fig. 1 are shown the lines of model 2023 which were used as the parent form. In Fig. 2 are shown the curves of sectional area for the four models and the parent form.

A paper presented at the twenty-sixth general meeting of the Society of Naval Architects and Marine Engineers held in Philadelphia, Nov. 14 and 15. The author is a United States naval constructor.

Model 2132 was made full at the entrance, with a fine run. Model 2135 was made relatively fine at the entrance and full in the run. Models 2133 and 2134 were intermediate between the two extreme models. The model with the full bow and that with the full stern were purposely made of an extreme type beyond anything that might be expected to be used, in order to give a wide scope to the investigation and to insure that the limiting condition as regards power should be obtained at either extreme.

In the four models the middle section of the parallel middle body—that is to say, the section which divided the parallel middle body into two equal portions—was placed at varying distances from the forward perpendicular, amounting to 31.3, 38.5, 53.4, and 60.5 per cent of the length of the ship, respectively.

Elaborate Preparations Made

The models were carefully made and all were fitted with the same cast stern frame, which included the stern bearing for the propeller shaft. The stern frame had the rudder cast with it. The whole frame and rudder was fitted to each of the four models before the self-propulsion experiments were undertaken, and, together with the propeller shaft, propeller, and dynamometer were transferred from one model to the other as the experiments with each model were completed.

The dynamometer consisted of a small direct-current motor, the armature shaft of which was directly connected with the propeller shaft by means of a flexible coupling. The armature shaft was free to float fore and aft in its bearings about $\frac{7}{16}$ inch in an axial direction. The armature shaft was connected to a calibrated spring by means of a thrust bearing, so that the axial displacement of the armature shaft gave a measurement of the propeller thrusts. Similarly, the frame of the motor was mounted so as to rotate in independent bearings. The torque developed by the motor acted against a calibrated spring so that the deflection of the spring indicated the torque of the motor. In addition to this there were suitable means provided for measuring the revolutions of the shaft.

The order of procedure in making the tests was as follows: The shaft and dynamometer were carefully lined up and the whole run for a sufficient time to warm up the bearings and reduce the bearing friction as much as possible. Owing to the fact that the dynamometer was placed close to the stern, but a short length of propeller shafting was necessary, and this was supported by two self-aligning bearings, one at the stern bearing and the other at the forward end of the stern tube. With the propeller shaft in place and everything working freely the model was towed in the model basin beneath the towing carriage at several different speeds, and the propeller shaft, without propeller, run at the range of revolutions to be covered in the course of the experiments. The propeller was then fitted to the shaft and cards for torque and thrust and rvolutions per minute were taken with the model self-propelled at different speeds. In these tests the model was guided by two plates about 10 inches in width placed at either end

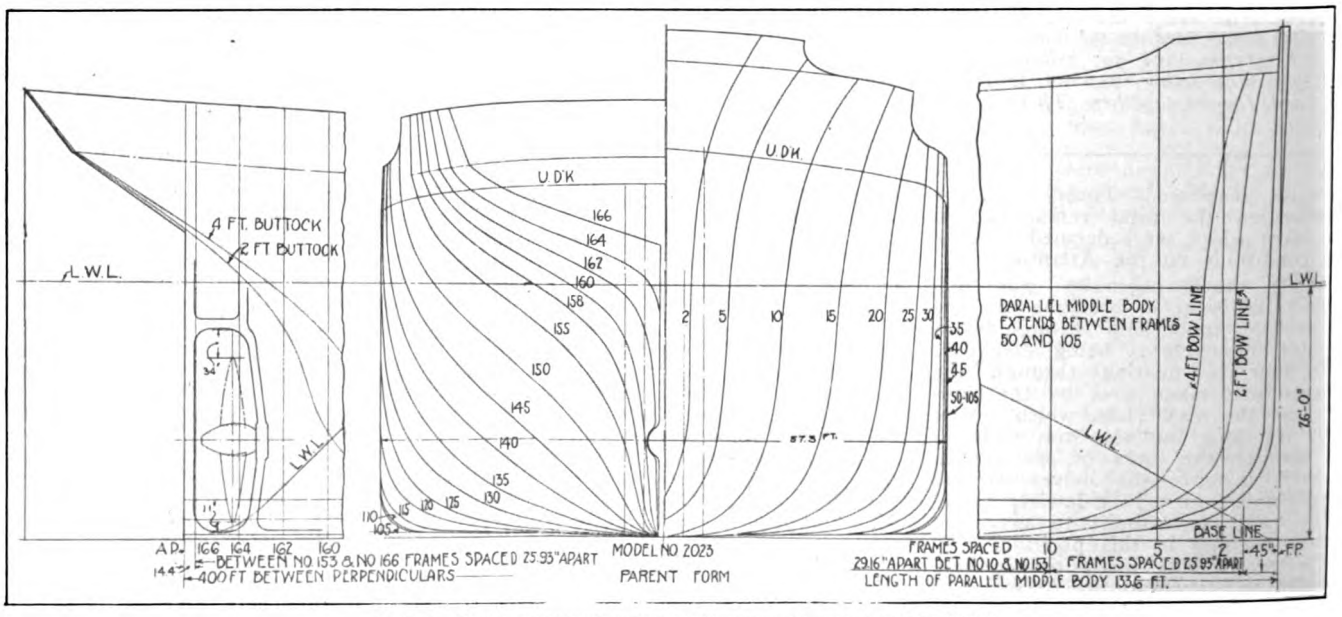

FIG. 1—LINES OF MODEL WHICH WAS USED AS THE PARENT FORM

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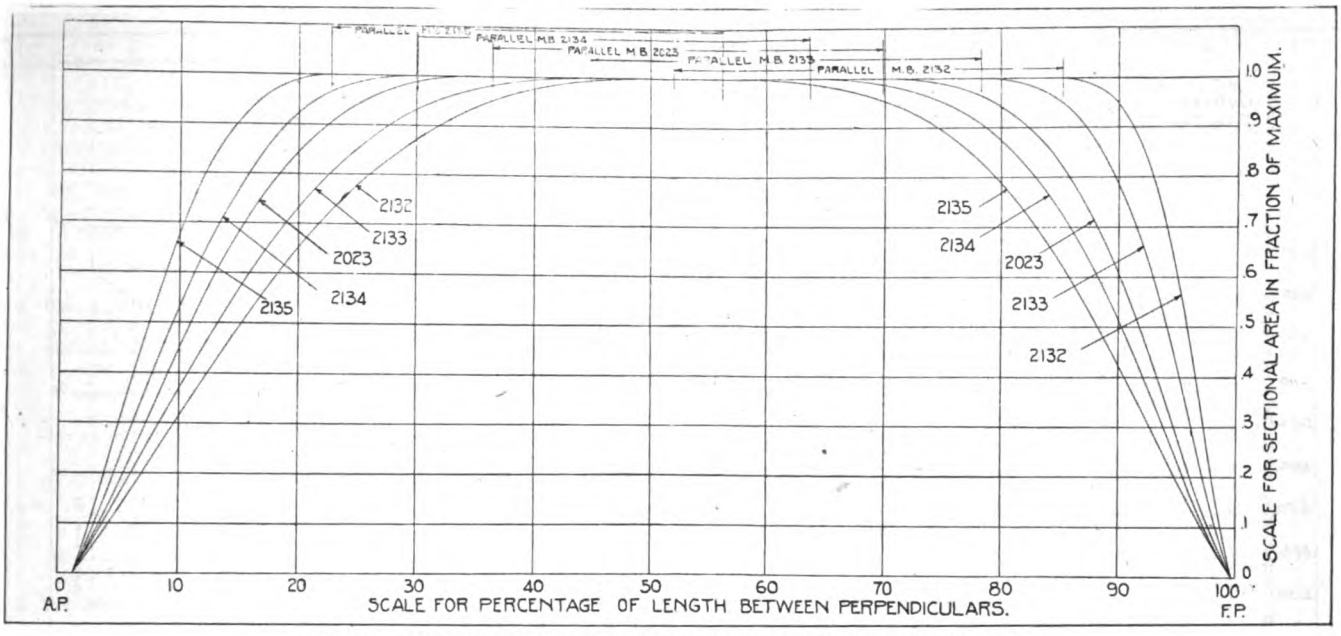

FIG. 2—CURVES OF SECTIONAL AREA FOR FOUR MODELS AND THE PARENT FORM

of the model, so as to steer it in a straight course.

The guide plates floated between the guilding points attached to the carriage, but the towing carriage did not exercise any force on the model in a fore-and-aft direction. Starting at low speeds corresponding to about 5 knots for the ship, the towing carriage was adjusted to run at a uniform speed. The rheostat controlling the speed of the propeller dynamometer was then adjusted so that the thrust of the propeller would just keep the model running as fast as the towing carriage, without striking the stops, which were placed at an interval of 6 inches. Thus, starting with the model in the mid position, it was free to gain or lose a distance of three inches as compared with the towing carriage before striking either stop. When the propeller was running at the proper speed to keep the model up with the towing carriage the record of thrust, torque and revolutions per minute was taken. If, in the course of the run, the model struck either stop on the carriage the run was discarded and another run made. Having obtained the desired data at the lowest speed, the carriage speed was increased for subsequent runs and similar data taken at higher speeds. The range covered corresponded to speeds of 5 to 12½ knots for the ship. About 40 different runs were made with each model, giving a corresponding number of points for plotting the torque, thrust, and revolutions-per-minute curves.

Special Design Involved

The armature of the propeller dynamometer was especially designed to reduce to a minimum the amount of magnetic thrust. This thrust increased with the torque and amounted to 0.17 pounds when the armature was displaced $\frac{7}{16}$ inch and the torque delivered to the shaft was 16 pounds-inches. Neglecting this at higher powers would have caused an error in thrust measurements of about 1.4 per cent but would not have caused any error in the power measurements. However, this magnetic thrust was separately calibrated, and corrections for it were made in working up the results of the experiments.

It is interesting to note that experiments of this kind with a very heavy model, in this case a displacement of 3774 pounds, afford a very sensitive means of checking the uniformity of speed of the towing carriage. If the towing carriage itself were not carefully adjusted, so as to eliminate slight variations in power required to drive it, owing to variations in the level of the tracks or uneven friction of the driving wheels or guide wheels, the resulting small accelerations and retardations of the carriage were made apparent. As the model, driven by its own propeller, when supplied with a constant voltage, ran at uniform speeds, it was possible to see the towing carriage gaining or losing distance of a few inches in 5 or 10 seconds, as slight inequalities of speed due to small variations in the resistance of the driving mechanism developed. In order to conduct self-propulsion experiments successfully with the method followed, it was necessary to have the towing carriage running in excellent condition.

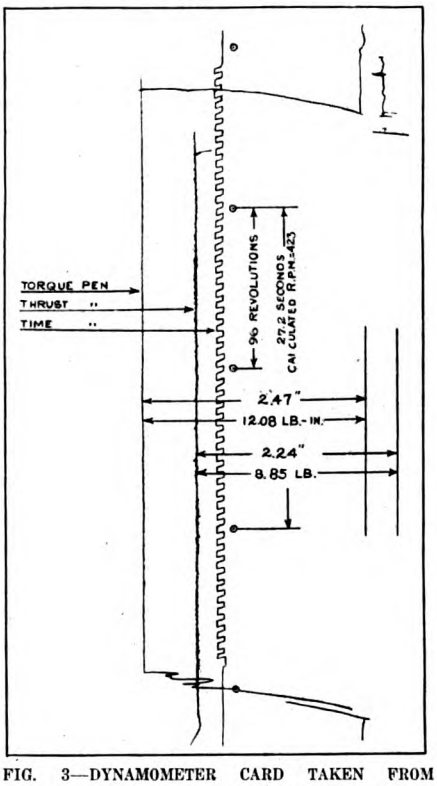

FIG. 3—DYNAMOMETER CARD TAKEN FROM MODEL RUNNING AT A SPEED CORRESPONDING TO APPROXIMATELY 10½ KNOTS

Uniform Conditions Assured

Immediately after completion of the self-propulsion tests on the model the propeller was removed and the runs to obtain the shaft friction and the thrust without propeller were repeated. The model was next connected with the resistance dynamometer on the towing carriage and the usual model resistance data taken. This insured that the conditions of test both for self-propulsion and for the resistance of the model would be uniform as regards conditions of the model, temperature of water, etc. Experiments on the four models were run on succeeding days, and the springs of the propeller dynamometer were calibrated both before and after the tests.

In Fig. 3 is shown one of the dynamometer cards taken for a model running at a speed corresponding to about 10½ knots for the ship. It will be noted that the deflection of the torque spring for this condition was 2.47 inches, for the thrust spring 2.24 inches, and the interval over which the revolutions were measured was 1.78 inches. With a little practice it was possible to read both the thrust and the torque deflections within 1/100 of an inch. The revolutions could be read to an accuracy of less than one-half of one per cent. Considering that the data taken are plotted and the whole averaged by means of faired curves, it is estimated that the results ob-

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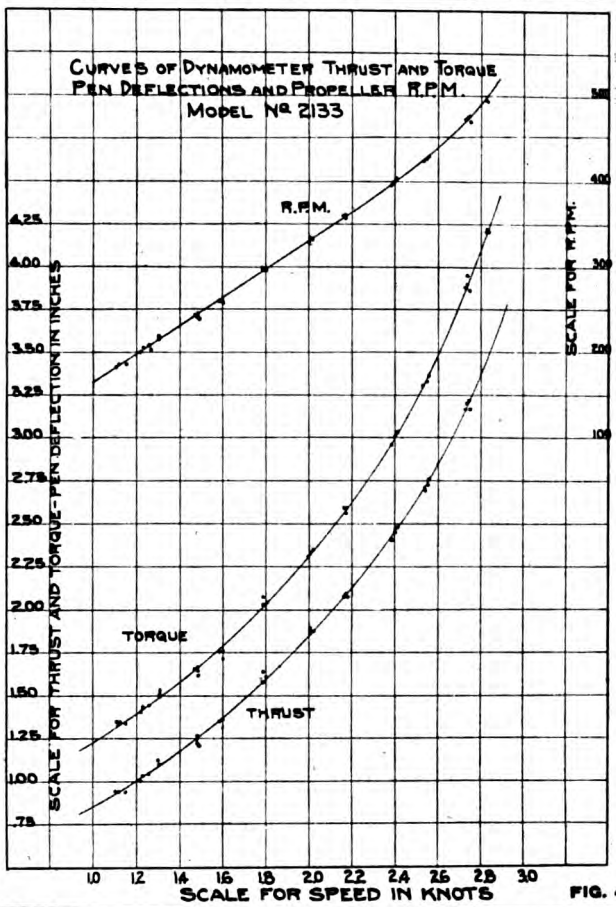
CURVES OF DYNAMOMETER THRUST AND TORQUE PEN DEFLECTIONS AND PROPELLER R.P.M.
MODEL No. 2133
R.P.M.
TORQUE
THRUST
SCALE FOR THRUST AND TORQUE-PEN DEFLECTION IN INCHES
SCALE FOR R.P.M.
SCALE FOR SPEED IN KNOTS

FIG. 4

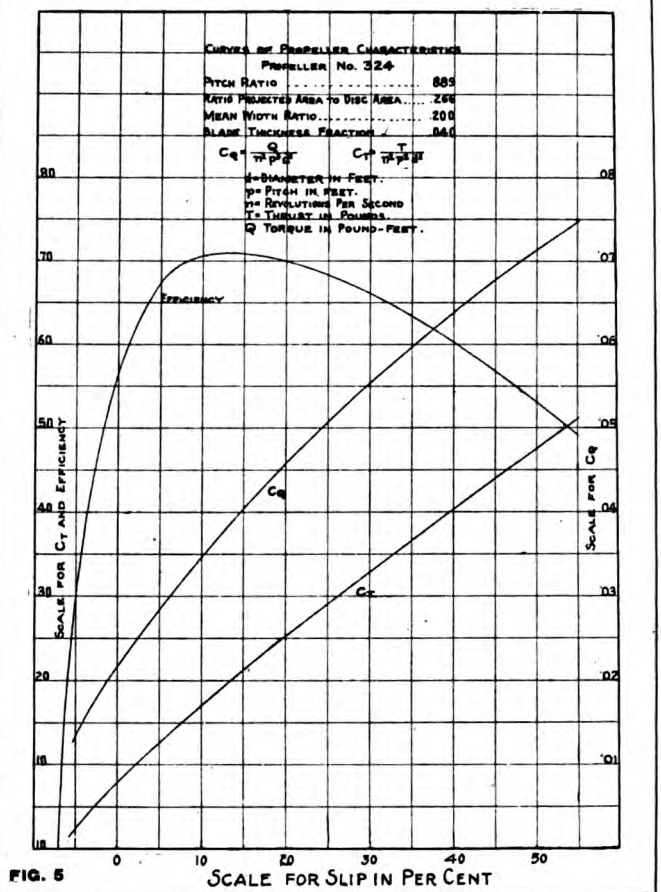
CURVES OF PROPELLER CHARACTERISTICS
PROPELLER No. 324
PITCH RATIO 885
RATIO PROJECTED AREA TO DISC AREA 266
MEAN WIDTH RATIO 200
BLADE THICKNESS FRACTION 040
D=DIAMETER IN FEET.
P= PITCH IN FEET.
n= REVOLUTIONS PER SECOND
T= THRUST IN POUNDS.
Q TORQUE IN POUND-FEET.
EFFICIENCY
SCALE FOR C_T AND EFFICIENCY
SCALE FOR C_Q
SCALE FOR SLIP IN PER CENT

FIG. 5

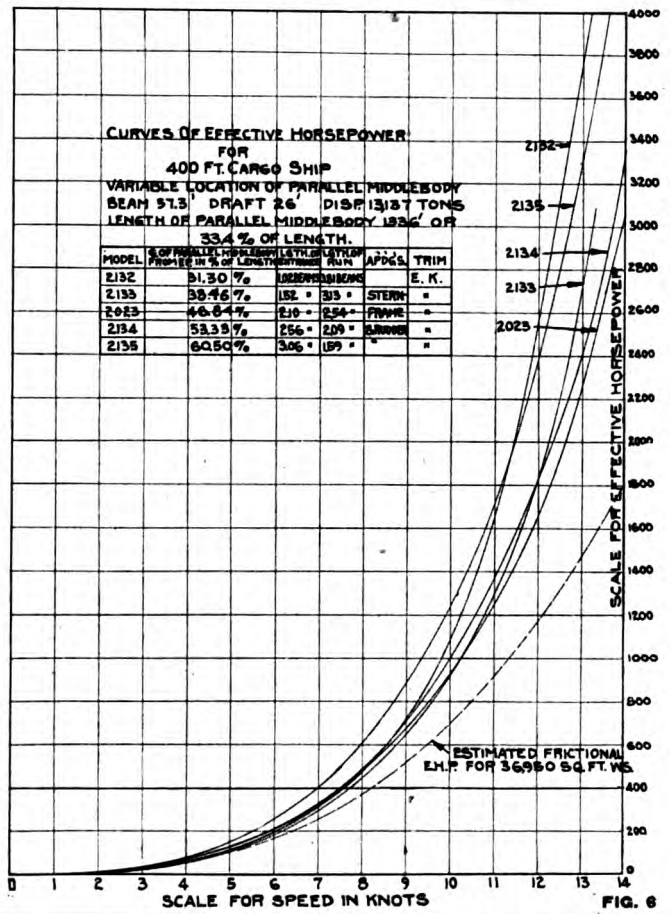
CURVES OF EFFECTIVE HORSEPOWER FOR 400 FT. CARGO SHIP
VARIABLE LOCATION OF PARALLEL MIDDLEBODY
BEAM 57.3' DRAFT 26' DISP. 13137 TONS
LENGTH OF PARALLEL MIDDLEBODY 133.6' OR 33.4 % OF LENGTH.
MODEL | % OF PARALLEL MIDDLEBODY IN % OF LENGTH | LENGTH OF ENTRANCE | LENGTH OF RUN | APPDGS. | TRIM
2132 | 31.30 % | | | | E. K.
2133 | 38.46 % | 152 ' | 313 ' | STERN | "
2023 | 46.84 % | 210 ' | 254 ' | FRAME | "
2134 | 53.33 % | 256 ' | 209 ' | BARRIER | "
2135 | 60.50 % | 306 ' | 159 ' | " | "
ESTIMATED FRICTIONAL E.H.P. FOR 36,950 SQ. FT. WS.
SCALE FOR EFFECTIVE HORSEPOWER
SCALE FOR SPEED IN KNOTS

FIG. 6

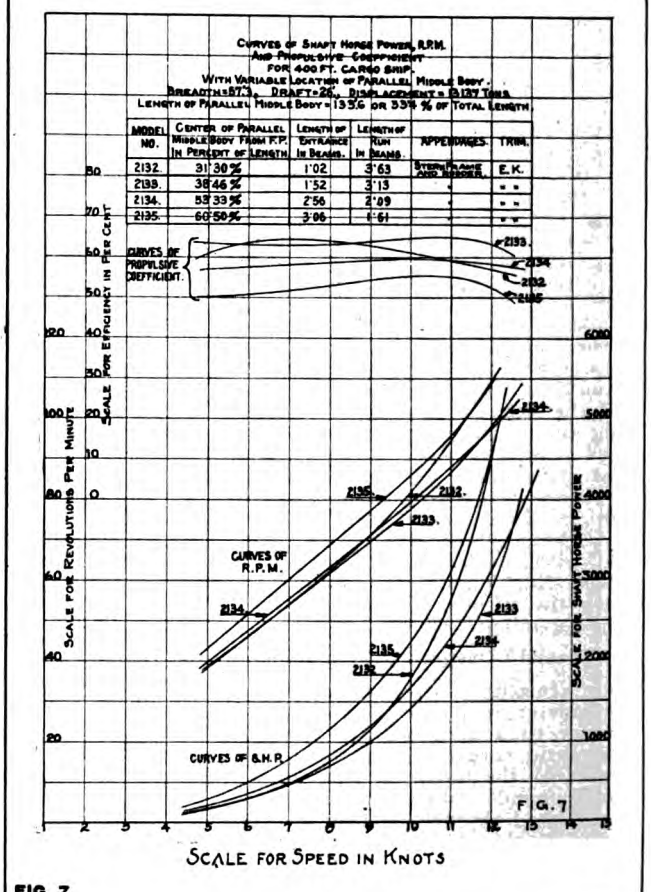
CURVES OF SHAFT HORSE POWER, R.P.M. AND PROPULSIVE COEFFICIENT FOR 400 FT. CARGO SHIP.
WITH VARIABLE LOCATION OF PARALLEL MIDDLE BODY.
BREADTH=57'3, DRAFT=26, DISPLACEMENT=13137 TONS
LENGTH OF PARALLEL MIDDLE BODY=133.6 OR 33⅓ % OF TOTAL LENGTH
MODEL NO. | CENTER OF PARALLEL MIDDLE BODY FROM F.P. IN PERCENT OF LENGTH | LENGTH OF ENTRANCE IN BEAMS. | LENGTH OF RUN IN BEAMS. | APPENDAGES. | TRIM.
2132. | 31.30 % | 1.02 | 3.63 | | E.K.
2133. | 38.46 % | 1.52 | 3.13 | " | " "
2134. | 53.33 % | 2.56 | 2.09 | " | " "
2135. | 60.50 % | 3.06 | 1.61 | " | " "
CURVES OF PROPULSIVE COEFFICIENT.
CURVES OF R.P.M.
CURVES OF S.H.P.
SCALE FOR EFFICIENCY IN PER CENT
SCALE FOR REVOLUTIONS PER MINUTE
SCALE FOR SHAFT HORSE POWER
SCALE FOR SPEED IN KNOTS

FIG. 7

FIG. 4—ACTUAL OBSERVATIONS FROM TESTS. FIG. 5—CHARACTERISTICS OF THE PROPELLER. FIGS. 6 AND 7—RESULTS OF INVESTIGATIONS

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tained as regards the three elements measured are correct within one per cent.

In Fig. 4 are shown the actual observations of the torque and thrust pen deflections, and the revolutions per minute of the propeller shaft plotted on speed of the model, the latter being measured by the speed of the towing carriage in the same manner as in the ordinary resistance tests.

The following are the dimensions of the propeller used in the experiments and also the dimensions expanded to the ship scale:

	Model	Ship
Diameter, inches	10.125	199
Pitch, inches	9	177
Pitch ratio	0.889	
Mean width ratio.....	0.20	
Number of blades.....	3	
Rates of projected to disc area	0.266	
Blade thickness fraction.	0.04	

The propeller had three blades of Taylor's standard form.

The propeller characteristics were obtained by separate tests of the propeller model run in free water, that is, in a separate apparatus where the propeller shaft projected well ahead, so that the propeller ran in water undisturbed by the action of the testing apparatus. The same motor dynamometer was used for the tests as was used for the self-propulsion tests, the only difference being that the propeller shaft was coupled to the forward end of the armature shaft instead of the after end.

Propeller Characteristics

The characteristics of the propeller are given in Fig. 5. The thrust constant, Ct, and the torque constant, Cq, are plotted on nominal slip following the method used by Schaffran. These constants, which are in non-dimensional form, lend themselves well to the analysis of self-propulsion experiments and to the extension of the results to the full-size ship.

The results of the investigation are given in Figs. 6, 7 and 8. An examination of the effective horsepower curves and the shaft horsepower curves for the different models shows, as would be expected, a wide variation in power required. By plotting cross curves of power at a speed of 11 knots it will be found that, for both the effective horsepower and the shaft horsepower, the best results are obtained when the middle section of the parallel middle body is placed about 43 per cent of the ship's length from the forward perpendicular. But 2000 shaft horsepower is required for the ship represented by model 2133 at a speed of 11 knots. This is considerably below that obtained with the ordinary 400-foot cargo ship of this displacement and may possibly be questioned as to whether it is not lower than could be expected to be obtained on a real ship. It must be remembered, however, that the lines are of good form and the friction of the shaft has been eliminated, so that the powers given do not include shaft friction. As to the reliability of the method followed it may be stated that in similar experiments made on a model of the twin-screw collier Jupiter, for which are available accurate trial data, the results of the model tests, when extended to the ship, agreed identically as regards the propeller revolutions and within 1 per cent as regards power and propulsive coefficient.

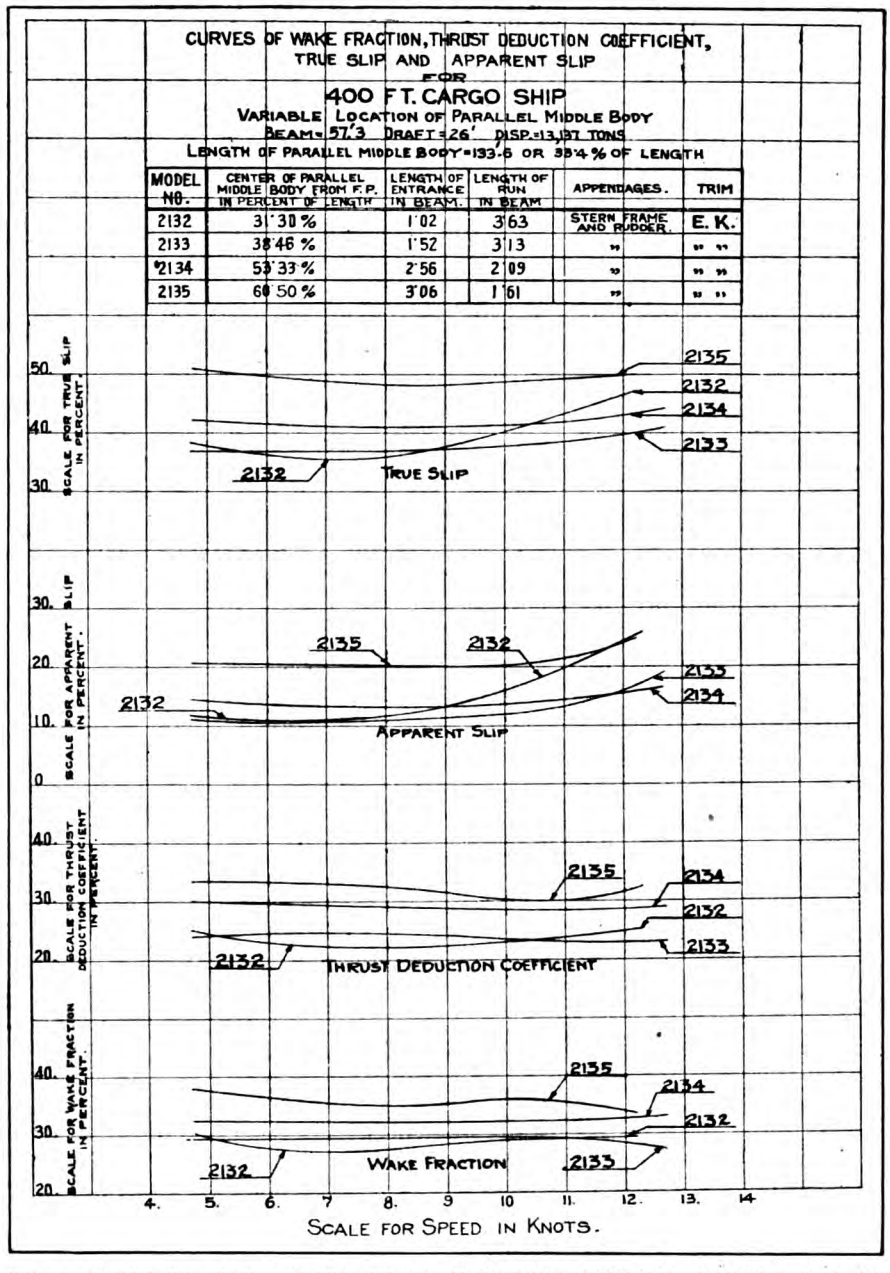
CURVES OF WAKE FRACTION, THRUST DEDUCTION COEFFICIENT, TRUE SLIP AND APPARENT SLIP
FOR
400 FT. CARGO SHIP
VARIABLE LOCATION OF PARALLEL MIDDLE BODY
BEAM=57.3 DRAFT=26' DISP.=13,137 TONS
LENGTH OF PARALLEL MIDDLE BODY=133.6 OR 33.4% OF LENGTH
MODEL NO. | CENTER OF PARALLEL MIDDLE BODY FROM F.P. IN PERCENT OF LENGTH | LENGTH OF ENTRANCE IN BEAM. | LENGTH OF RUN IN BEAM | APPENDAGES. | TRIM
2132 | 31.30% | 1.02 | 3.63 | STERN FRAME AND RUDDER. | E. K.
2133 | 38.46% | 1.52 | 3.13 | " | " "
2134 | 53.33% | 2.56 | 2.09 | " | " "
2135 | 60.50% | 3.06 | 1.61 | " | " "
SCALE FOR TRUE SLIP IN PERCENT.
TRUE SLIP
SCALE FOR APPARENT SLIP IN PERCENT.
APPARENT SLIP
SCALE FOR THRUST DEDUCTION COEFFICIENT IN PERCENT.
THRUST DEDUCTION COEFFICIENT
SCALE FOR WAKE FRACTION IN PERCENT.
WAKE FRACTION
SCALE FOR SPEED IN KNOTS.

FIG. 8—CURVES OF WAKE FRICTION, THRUST DEDUCTION COEFFICIENT, APPARENT SLIP AND TRUE SLIP

In order to avoid confusion in terms the following definitions of thrust deduction coefficient, t, and wake fraction, w, are given:

$$t = \frac{T - R.}{T}; \; w = \frac{V - V'}{V},$$

in which T is the thrust of the propeller, R the resistance of the ship, V the speed of the ship, V' the speed of advance of the propeller in the water in which it revolves to drive the ship.

As was to be expected, the wake fraction and thrust deduction coefficient both increase with fullness of the stern. It is interesting to note that in all cases the wake fraction is considerably greater than the thrust deduction coefficient, resulting in a hull efficiency greater than unity. The wake fraction obtained for the different models at a speed corresponding to 11 knots for the ship varies from 0.29 to 0.35.

The formula for wake fraction given by Taylor is as follows: $w = -0.05 + 0.5b$, in which b is the block coefficient. This would give for all of these models a wake fraction of 0.336. The average of the results obtained in these experiments is 0.31, which is but slightly less than that estimated by the above formula.

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How Huge Liner St. Paul Was Righted

The Vessel Was Pulled Up on an Even Keel by Means of Cables—Success Was Due to Careful Planning

By B. K. Price

ONE of the most interesting chapters in the romantic career of the American liner ST. PAUL came to a close recently, when the vessel, after resisting the efforts of leading marine engineers for almost five months, was lifted from the bottom of North river, New York harbor, and refloated. That the liner should come out of this experience sound after more than 20 years' continual service, speaks well not only of the work of the salvors, but of the construction of the vessel. The ST. PAUL, with her sister ship the PHILADELPHIA, was built in 1895 at Cramps yards, Philadelphia, in conformity with an act of congress, and is owned by the International Mercantile Marine Co.

The chapter opened on the morning of April 25, when the ST. PAUL turned over on her side while being warped into her pier. She had been towed from the Erie basin in Brooklyn, where she had been converted into a transport, and had proceeded in normal fashion until almost parallel to the dock when she heeled suddenly and sank. As the vessel rolled over, her smokestacks and masts were jammed against the side of the wharf and a mass of rigging and other materials on deck were carried overboard. The ship, which is 535 feet long and 63 feet beam, sank in a way to block to a large extent the slip between piers 60 and 61. The slip is 240 feet wide and the ST. PAUL laying on her side took up 80 feet of this space. At one point, there was but 50 feet between her upper structure and the nearby dock.

When representatives of the Merritt & Chapman Derrick & Wrecking Co., New York, the salvor, came upon the scene, they found the vessel engulfed in about 32 feet of mud and 54 feet of water, resting at a list of 73 degrees. Due to the size of the ST. PAUL and the restricted area of the slip, the task of raising the vessel presented a difficult problem, a problem, which in fact had two phases, for the vessel not only had to be refloated, but first had to be righted on a relatively even keel. The vessel, as a mass to be moved, represented more than 13,000 tons, fully double the weight of any other craft ever refloated from a similar position.

One of the first steps taken in righting the vessel, was to clear away the smokestacks and masts by use of dynamite, and to remove all possible top weight. This included the removal of a number of rapid fire guns, which had been installed to repel U-boat attacks, life boats, fittings and other detachable ship material down as far as the third deck. Action was also taken at this time in closing portholes, through which mud and water was continually streaming, thus hampering the progress of the work. To add to the buoyancy of the vessel, it was decided at this time to seal up the forward and after holds. To this end it was necessary to install under water a number of massive cement barriers and patches. For expelling the water, 22 pumps with discharges from 4 to 12 inches were employed, including three centrifugal 12-inch pumps. These pumps were supplied with steam by a 4-inch line, running along the edge of the upper deck. Compressed air was also resorted to in expelling the water, but the use of this method was confined to the forepeak.

Bulkheads Are Dynamited

In facilitating the drainage of water, it was found necessary to break through the bulkheads in some places in order that water could be reached by water intakes. To this end, dynamite was used at first, but owing to the structural damage incurred and the resulting cost for repairs, another method was employed, and for the first time. An oxy-acetylene cutting torch had been perfected by two of the members of the wrecking crew for work under water and was employed in this work with complete success. Holes were made in the steel barriers up to 14 inches in diameter, the actual cutting time being a matter of a few minutes. Openings were made in this way down as far as 50 feet under the surface of the water.

To aid in the rolling movement, 21 tripods, or A-frames, were erected on the starboard, or exposed side of the vessel. Each frame was 30 feet high and consisted of two angle iron, vertical posts, supported by two back legs, each 10 inches square. Attached to these various A-frames were steel hawsers leading to 21 cement anchoring blocks, of 10 tons each, sunk in a trench dredged down 68 feet below the water between piers 60 and 59. Twenty-one hoisting engines furnished the pulling power, which amounted to about 40 tons to each cable. Further to assist in this work, four pontoons were installed along the port side of the vessel. Chain cables were made fast to the vessel and led up through wells in the pontoons and there made fast to hydraulic lifting gear. The four pontoons with their lifting gear created a lifting effect of 1200 tons, which in addition to the 840 tons of the A-frame apparatus, made a total righting effect of 2000 tons.

While this various equipment was being placed, dredging operations were going on around the wreck with the double purpose of clearing the way for the divers and providing deeper water into which the liner might be shifted during the concluding work of righting and refloating her. All this took several weeks to accomplish, and it was not until July 22 that all preparations had been completed and the rolling movement begun. Within less than a week, the vessel had been righted from a list of 73 to 27 degrees, which was as far as the pontoons could be used effectively.

It was at this juncture, that the second stage of the work was begun. The pontoons were taken away and the work of sealing the entire vessel was commenced. Perhaps one of the most noteworthy of all the minor operations was accomplished at this time. In the inky darkness of one of the inner recesses of the ship, an open ash port was discovered, buried under several feet of mud, and there was no way to seal the opening except from within the ship. A pattern had to be made of the opening and the existing bolt holes, and a patch plate fashioned and then carried down and fitted into place. The divers, working without light and many feet under the surface of the water, placed and tightened the 30 bolts and made the opening watertight, the complete operation taking less than two days. Altogether, more than 500 openings had to be closed throughout the ship. With a view to making the vessel absolutely watertight, cofferdams were constructed, running about 360 feet on the port side and 290 feet on the starboard side, and high enough to keep out the water at high tide.

In rolling the vessel during the second stage, the derricks MONARCH and COMMANDER were brought into action. The chains previously attached to the pontoons were gripped forward and aft by the two craft, which exercised a lifting and heeling force. This in conjunction with the combined righting effect of the pumps and the pulling apparatus resulted in reducing the list from 27 to 16 degrees. From this point on, the A-frames along the starboard side were no longer needed, and were consequently removed. The salvors then entered upon the third and last stage of the work. This consisted principally of pumping the entire ship and steadying her by means of the derricks MONARCH and COMMONWEALTH on the port side and the derricks COMMANDER and CHIEF on the starboard side.

Work under this arrangement was started on Sept. 11, and within five hours after starting the pumps the ST. PAUL cleared the bottom fore and aft, standing at a list of 4 degrees. This list was more or less in evidence throughout the remaining two weeks, the time required for completing the pumping operations. Finally, it was seen that despite the fact that the cofferdams had been removed as well as mud and wreckage on the port side, there would still be a slight list, so a compensating ballast of more than 300 tons was placed on the starboard side. After the vessel was fully afloat it was found that there remained 1000 or more tons of silt throughout the ship on the port side. The removal of this, however, required only a few days and on Sept. 27 the ST. PAUL was turned over to the American line.

The successful completion of this work reflected great credit upon the efforts of Capt. I. M. Tooker, in charge as superintendent and Ralph E. Chapman, the salvage engineer. The job unquestionably stands as one of the most remarkable in the annals of marine salvaging.

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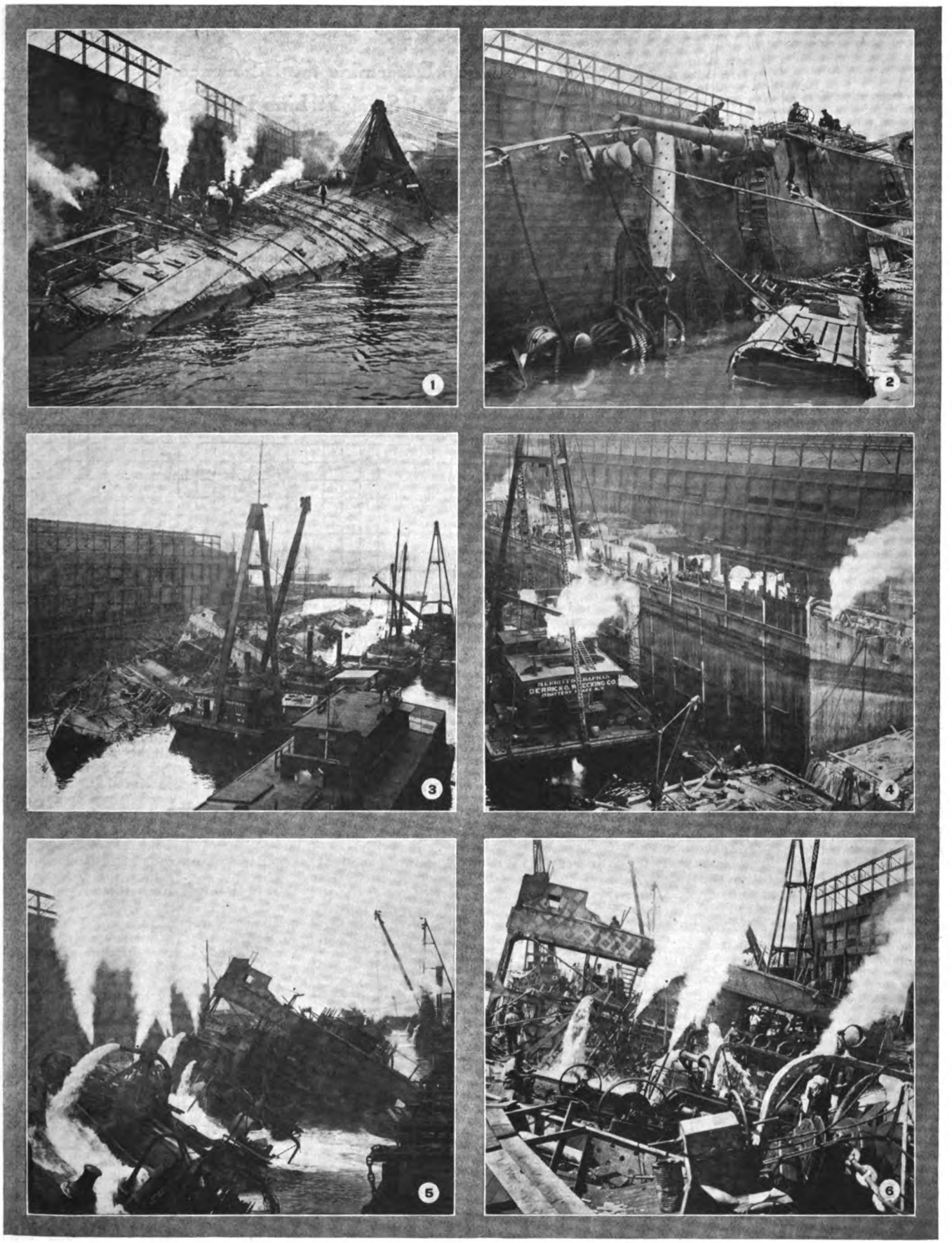

FIG. 1—FIRST ROLLING OPERATION, A-FRAMES USED TO SUPPORT CABLES. FIG. 2—CLEANING AWAY DEBRIS FROM DECK—OWING TO ITS SECURE MOUNTING THE HEAVY GUN ON THE PORT SIDE REMAINED IN PLACE. FIG. 3—VESSEL AT 27-DEGREE LIST DURING ROLLING OPERATION. FIG. 4—MAIN COFFERDAM ON PORT SIDE OF WRECK. FIG. 5—PUMPING OUT THE WRECK—THE PONTOONS ARE SHOWN AT THE RIGHT. FIG. 6—DECK VIEW TAKEN DURING SECOND PUMPING OPERATION.

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Tests on Simplified Ship Forms

This Investigation Was Made to Determine the Difference in Resistance Between Curved and Straight Line Designs

By H. C. Sadler and T. Yamamoto

THE question of the simplification of ship forms is one that has received a good deal of attention during the past year. In their anxiety to produce a simple form from a structural standpoint, a good many designers, not familiar with ships, have ignored entirely the question of economical propulsion.

During the past year some experiments upon "straight frame" forms have been conducted in the tank at the University of Michigan, and the results are thought to be of sufficient interest to place on record.

The main object of the experiments was to determine what difference in resistance existed between an ordinary shipshape form and one in which the curved form of the frames was replaced by straight lines. No particular attempt was made to develop the best possible form, but the main features of the two types were kept constant: The diagonal line representing the corner was in all cases made a straight line, with the view that, if the bilge corner were cut off, this would facilitate construction.

The body plans shown in Figs. 9, 10, 12 and 13 represent the various forms used. The models were 10 feet long and 16 inches wide. For each particular type the following characteristics were kept constant: Length, breadth, draft, displacement at load draft, with the corner cut off, the curve of sectional areas and hence prismatic coefficient, and the shape of the waterline. The models were tested at three different drafts covering the usual range.

In each case the model was first tried with the sharp corner, and later this was removed. Two different slopes were given to the bilge diagonal to determine the effect of this feature. In one case also the lower knuckle was given a small enough slope to keep it within the double bottom, the top knuckle in this case remaining the same as in the form shown in Fig. 9. Table I gives the characteristics of all the forms tried.

The fuller models, marked 10 per cent and 20 per cent, were obtained from the finer forms by adding 10 per cent and 20 per cent middle body and contracting the form of the ends to keep the length constant.

The curves of sectional areas and load waterline are shown in Figs. 1 and 2, and it will be noticed that, in order to use the same form in all cases, this necessitated a somewhat fuller line forward than was compatible with east of propulsion.

The general results are summarized in the curves Figs. 5, 6 and 7. A comparison of each set of curves for each type shows that the shipshape is the best, and that, of the other two forms with the corner off, the one with the steeper slope to the bilge diagonal gives better results than where this is at a smaller angle. At the lower speed-length ratios there is

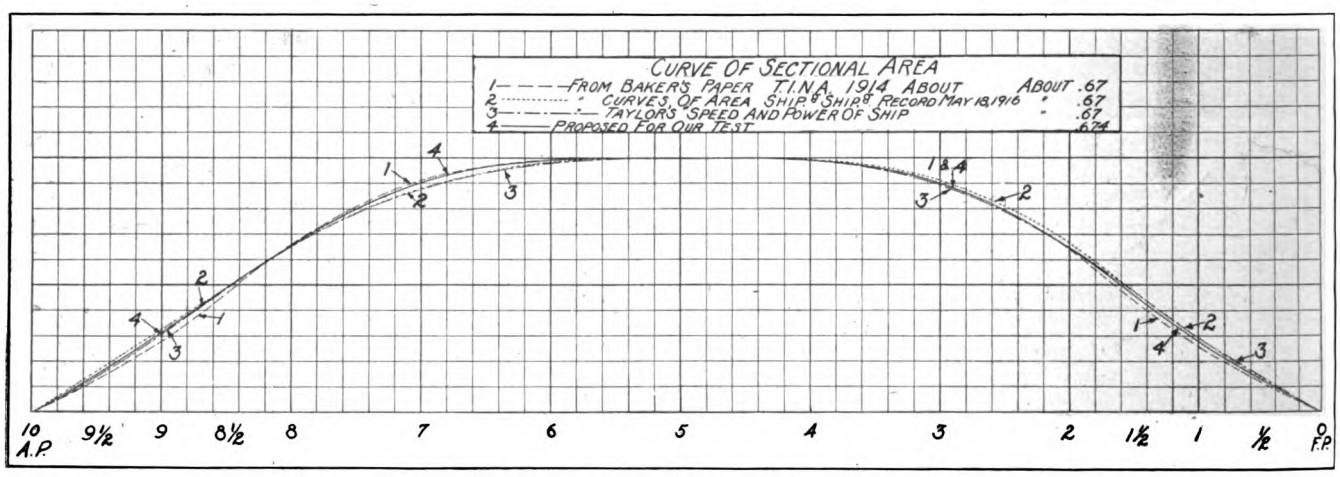
CURVE OF SECTIONAL AREA
1 ---FROM BAKER'S PAPER T.I.N.A. 1914 ABOUT ABOUT .67
2 ..... " CURVES OF AREA, SHIP & SHIP RECORD MAY 18, 1916 " .67
3 -.-.- " TAYLOR'S SPEED AND POWER OF SHIP " .67
4 ——— PROPOSED FOR OUR TEST .674
10 A.P. 9½ 9 8½ 8 7 6 5 4 3 2 1½ 1 ½ 0 F.P.

FIG. 1—CURVE OF SECTIONAL AREA

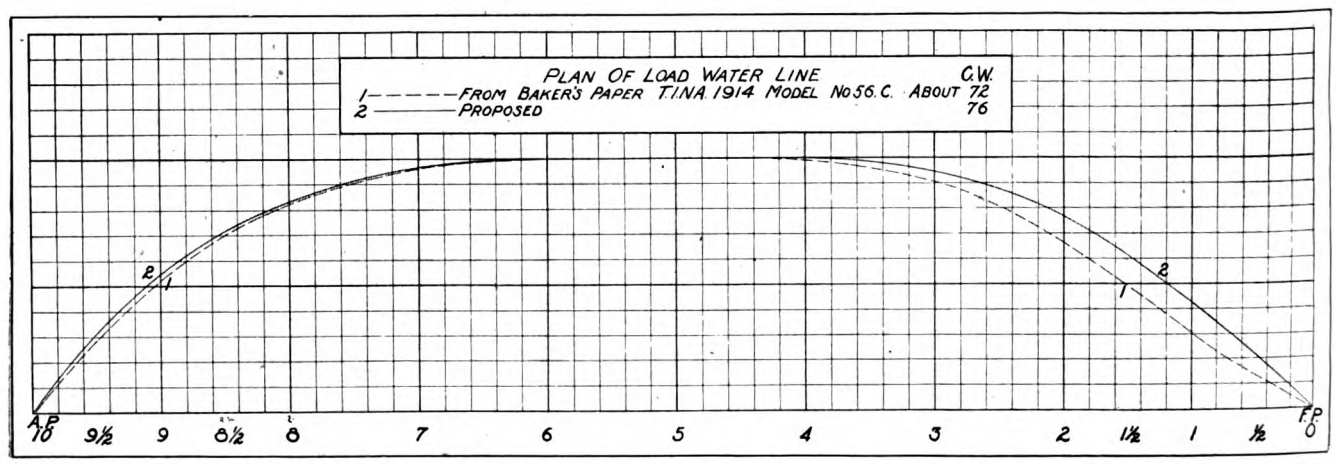

FIG. 2—PLAN OF LOAD WATERLINE.

A paper presented at the twenty-sixth general meeting of the Society of Naval Architects and Marine Engineers held in Philadelphia, Nov. 14 and 15.

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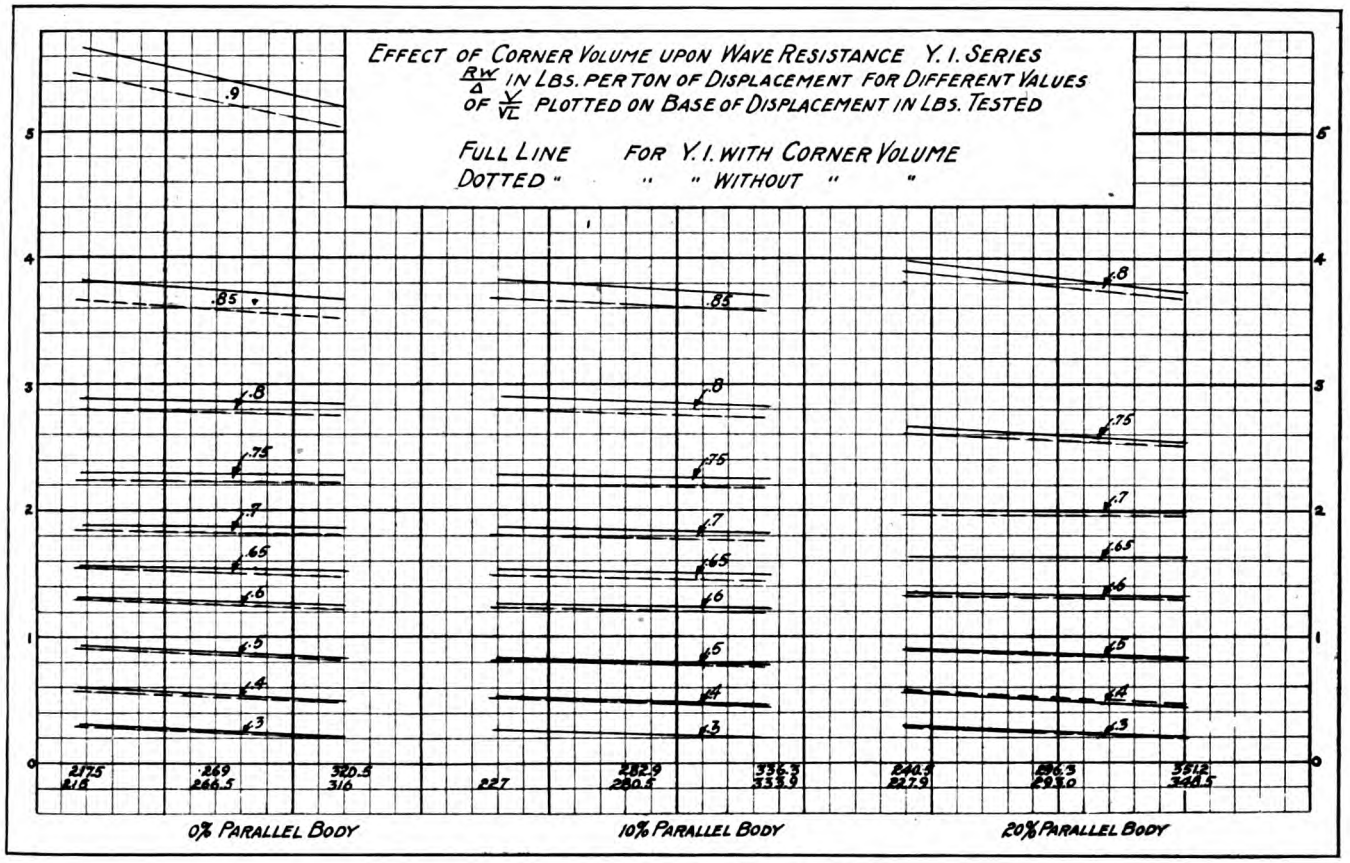
EFFECT OF CORNER VOLUME UPON WAVE RESISTANCE Y. 1. SERIES
RW/Δ IN LBS. PER TON OF DISPLACEMENT FOR DIFFERENT VALUES OF V/√L PLOTTED ON BASE OF DISPLACEMENT IN LBS. TESTED
FULL LINE FOR Y. 1. WITH CORNER VOLUME
DOTTED " " " WITHOUT " "
0% PARALLEL BODY
10% PARALLEL BODY
20% PARALLEL BODY

FIG. 3—EFFECT OF CORNER VOLUME ON WAVE RESISTANCE Y 1 SERIES

little, if any, difference, and such as there is is of the order of 1 to 2 per cent.

The effect of retaining the sharp corner appears in all cases to increase the resistance somewhat as shown in Figs. 3 and 4, that is, the resistance increases at a somewhat more rapid ratio than the added wetted surface. The remaining form with the lower knuckle line dropped is shown in Fig. 12, and shows slightly more resistance than the best of the other forms, but the amount is small. In fact it seems to lie between the first

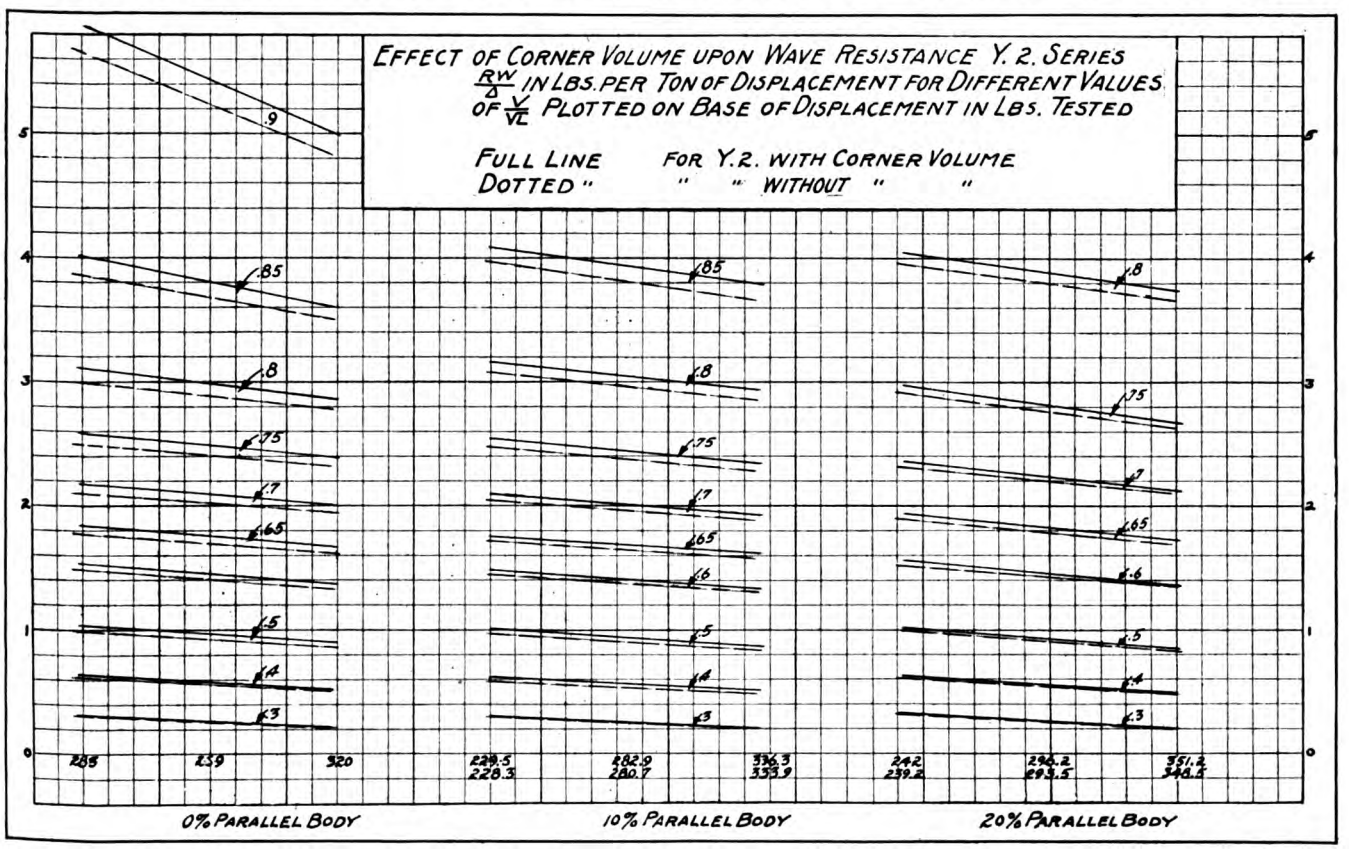
EFFECT OF CORNER VOLUME UPON WAVE RESISTANCE Y. 2. SERIES
RW/Δ IN LBS. PER TON OF DISPLACEMENT FOR DIFFERENT VALUES OF V/√L PLOTTED ON BASE OF DISPLACEMENT IN LBS. TESTED
FULL LINE FOR Y. 2. WITH CORNER VOLUME
DOTTED " " " WITHOUT " "
0% PARALLEL BODY
10% PARALLEL BODY
20% PARALLEL BODY

FIG. 4—EFFECT OF CORNER VOLUME ON WAVE RESISTANCE Y 2 SERIES

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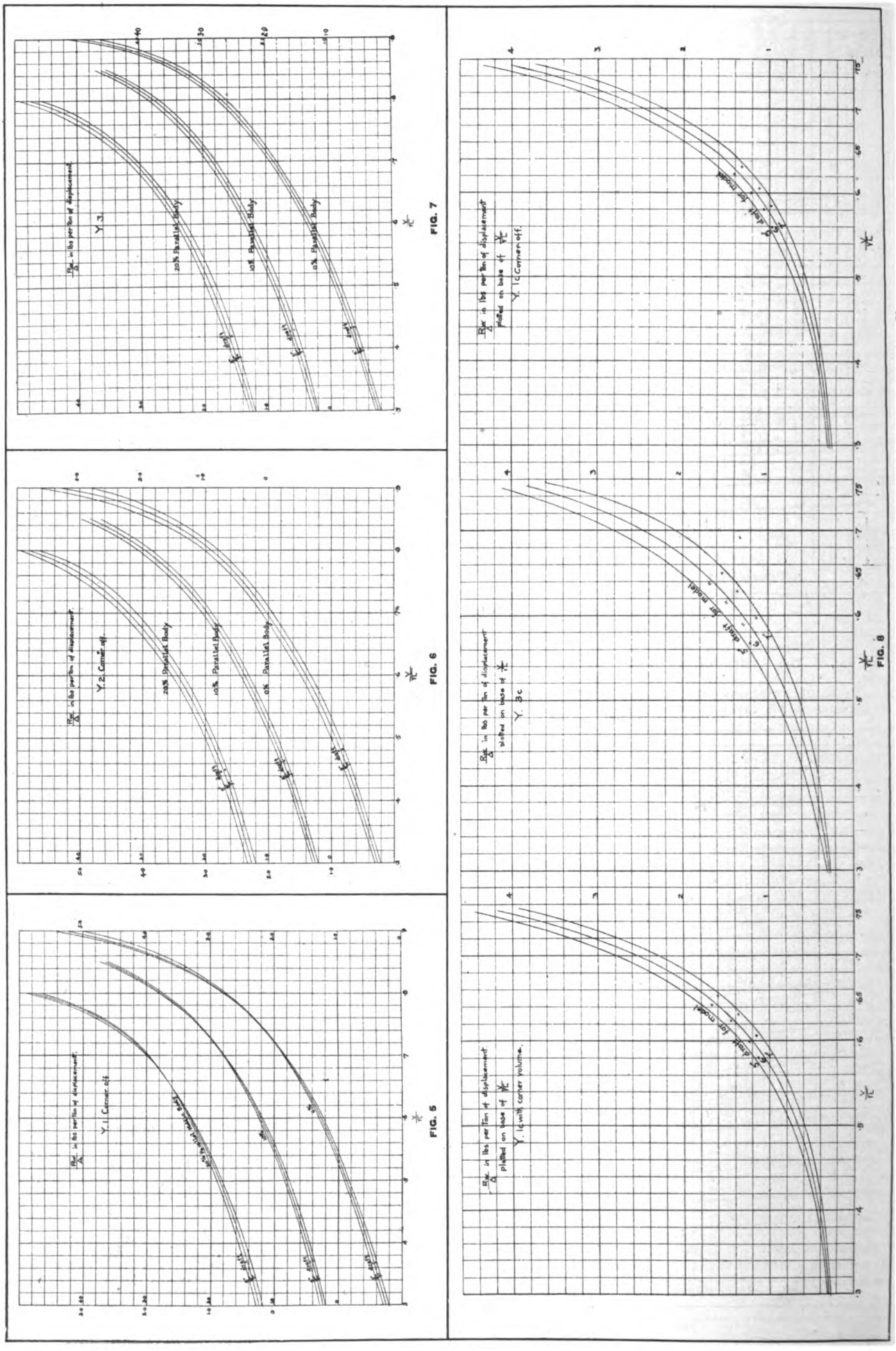

FIGS. 5, 6 AND 7—SOME GENERAL RESULTS SUMMARIZED IN CURVES—FIG. 8—RESULTS OF TESTS ON FULL FORM MODEL

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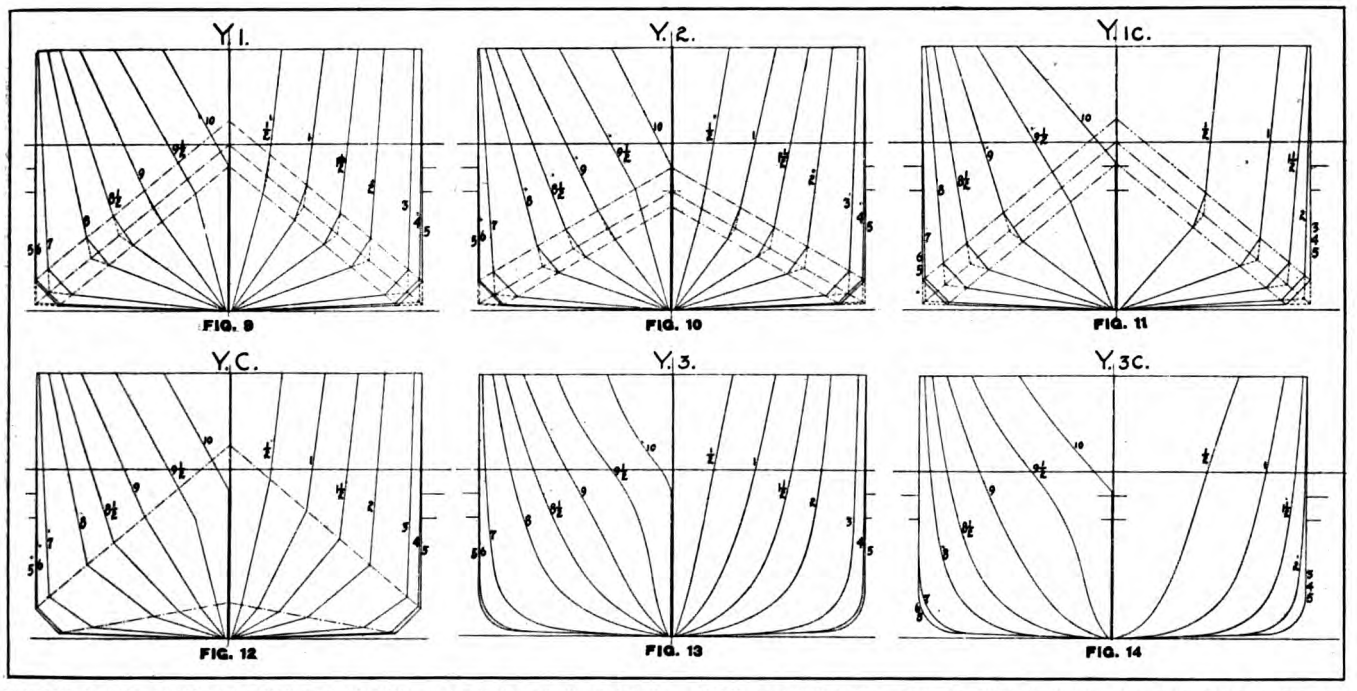

VARIOUS FORMS OF MODELS USED IN MAKING THE TESTS—THESE MODELS WERE 10 FEET LONG AND 16 INCHES WIDE AND FOR EACH TYPE THE CHARACTERISTICS OF LENGTH, BREADTH, DRAFT, DISPLACEMENT, ETC., WERE KEPT CONSTANT

two forms more than in the others.

A similar set of tests was carried out upon a model of fuller form. In this case the curve of sectional areas was changed to one suitable for this type. The body plans are shown in Figs. 11 and 14. The particulars of the models are given in table II.

The results of the tests are shown in Fig. 8, and in general are of the same character as in the previous series. The effect of retaining the corner volume at the bilge is to increase the resistance about 3 to 4 per cent, or approximately the same

Table I

Characteristics of All the Forms Tried

Y. 1. (corner off)

Draft	B/d		0 per cent	10 per cent	20 per cent
7″	2.285	Long. Coeff.	.674	.707	.739
		Block Coeff.	.655	.688	.718
		Mid. Coeff.	.973	.973	.973
		Water Line Coeff.	.760	.784	.808
6″	2.66	Long Coeff.	.662	.697	.728
		Block Coeff.	.641	.675	.706
		Mid. Coeff.	.969	.969	.969
5″	3.2	Long. Coeff.	.646	.681	.716
		Block Coeff.	.621	.655	.688
		Mid. Coeff.	.962	.962	.962

Y. 1. (with corner volume)

Draft	B/d		0 per cent	10 per cent	20 per cent
7″	2.285	Long. Coeff.	.673	.706	.737
		Block Coeff.	.660	.693	.724
		Mid. Coeff.	.983	.983	.983
		Water Line Coeff.	.760	.784	.808
6″	2.66	Long. Coeff.	.661	.696	.728
		Block Coeff.	.647	.682	.713
		Mid. Coeff.	.979	.979	.979
5″	3.2	Long. Coeff.	.644	.679	.712
		Block Coeff.	.628	.662	.694
		Mid. Coeff.	.963		.963

Y. 2. (corner off)

Draft	B/d		0 per cent	10 per cent	20 per cent
7″	2.285	Long. Coeff.	.674	.708	.739
		Block Coeff.	.655	.688	.718
		Mid. Coeff.	.973	.973	.973
		Water Line Coeff.	.760	.784	.808
6″	2.66	Long. Coeff.	.662	.697	.729
		Block Coeff.	.641	.675	.706
		Mid. Coeff.	.969	.969	.969
5″	3.2	Long. Coeff.	.646	.683	.716
		Block Coeff.	.623	.659	.691
		Mid. Coeff.	.965	.965	.965

Y. 2. (with corner volume)

Draft	B/d		0 per cent	10 per cent	20 per cent
7″	2.285	Long. Coeff.	.672	.706	.737
		Block Coeff.	.659	.694	.724
		Mid. Coeff.	.983	.983	.983
		Water Line Coeff.	.760	.784	.808
6″	2.66	Long. Coeff.	.660	.695	.728
		Block Coeff.	.646	.680	.713
		Mid. Coeff.	.979	.979	.979
5″	3.2	Long. Coeff.	.646	.679	.716
		Block Coeff.	.630	.662	.698
		Mid. Coeff.	.975	.975	.975

Y. 3.

Draft	B/d		0 per cent	10 per cent	20 per cent
7″	2.285	Long. Coeff.	.673	.706	.737
		Block Coeff.	.655	.688	.718
		Mid. Coeff.	.974	.974	.974
		Water Line Coeff.	.760	.784	.808
6″	2.66	Long. Coeff.	.661	.696	.728
		Block Coeff.	.641	.675	.706
		Mid. Coeff.	.970	.970	.970
5″	3.2	Long. Coeff.	.647	.683	.718
		Block Coeff.	.623	.658	.692
		Mid. Coeff.	.964	.964	.964

Y. C.

Draft	B/d		0 per cent	10 per cent	20 per cent
7″	2.285	Long. Coeff.	.674		.738
		Block Coeff.	.656		.718
		Mid. Coeff.	.984		.984
		Water Line Coeff.	.760		.808
6″	2.66	Long. Coeff.	.661		.729
		Block Coeff.	.641		.706
		Mid. Coeff.	.969		.969
5″	3.2	Long. Coeff.	.044		.715
		Block Coeff.	.620		.688
		Mid. Coeff.	.963		.963

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as that due to the added surface. Compared with the shipshape form, there is practically no difference in resistance between this and the simplified form with the corner cut off.

Although time did not permit of carrying out a complete set of rolling experiments, some of the models were tried and it was found that the effect of the sharp corner upon the reduction of rolls was most marked, and that even with the corner removed these models came to rest quicker than the shipshape form. The general conclusions that may be drawn are as follows:

1.—Vessels of the straight frame type can be designed which will have about the same resistance as a shipshape form.

2.—If the diagonal line of the corner be given the wrong slope, this will increase the resistance due to the lack of conformity with the proper stream line flow.

3.—The effect of maintaining the square corner is to increase the bare hull resistance, but as vessels of this form would not need bilge keels the net result from a horsepower standpoint would be about the same as for a shipshape form.

4.—Probably the best results from a resistance standpoint would be obtained by using diagonal line which is of a curved form in the body plan.

Table II

Particulars of Full Model Form

Draft B/d		Y.I.C. corner-off	Y.3.C.	Y.I.C. with corner volume
7″ 2.285	Coeff			
	Long. Coeff..	.801	.798	.801
	Block Coeff..	.779	.779	.785
	Mid Coeff..	.973	.976	.981
6″ 2.66	Long. Coeff..	.791	.788	.791
	Block Coeff.	.766	.766	.773
	Mid. Coeff..	.968	.972	.978
5″ 3.2	Long. Coeff..	.780	.778	.780
	Block Coeff..	.749	.750	.759
	Mid. Coeff..	.961	.965	.974

Australian wheat continues to arrive in sailing ships at San Francisco, the Columbia river and Puget sound ports. It is coming in vessels which carry lumber to the Antipodes and under normal conditions they would return either in ballast or with coal. A steel steamer, built at Vancouver, B. C., has sailed for Europe with 50,000 bushels of wheat, part of it from Australia and part from Canadian fields. The Australian wheat comes in sacks and at the Vancouver elevator it is bulked and cleaned before being shipped to Great Britain.

Pearl Shell---One of Uncle Sam's Fleet

THE steamship PEARL SHELL, one of the vessels built recently for the Shell Oil Co. of California and taken over by the government was constructed by the Harlan & Hollingsworth plant of the Bethlehem Shipbuilding Corp., Wilmington, Del., and is an excellent example of some of the more recent additions to the United States merchant marine. The principal dimensions of the vessel are as follows: Length overall 411 feet, beam 53 feet, and molded depth 29 feet. The gross tonnage of the vessel is 5845. The PEARL SHELL is shown in the accompanying illustration.

As is customary in vessels of this class the propelling machinery is located aft. The engine is of the inverted, direct acting, triple expansion type, and develops 2400 horsepower. It has cylinders 29 x 45 x 74 inches in diameter with a 48-inch stroke. Steam at 180 pounds pressure is supplied by three single-end Scotch boilers, located two athwartships and one forward, all having a common stokehold. Each boiler has three corrugated furnaces and 368 3-inch tubes which provide an evaporating surface of 2667 square feet. The grate furnace is 64.4 square feet. The boilers are operated under forced draft and are arrranged to burn either coal or oil.

An interesting feature of the PEARL SHELL is the use of superheated steam. The superheating of the steam is accomplished by means of a fire-tube superheater furnished by the Locomotive Superheater Co., New York. Each boiler has four cast steel headers or collectors. These are arranged in pairs and each pair has one saturated and superheated header. They are connected by units of cold drawn, seamless steel tubes, which extend into the boiler tubes. Each pair of units is attached to the headers by means of a clamp and stud and may be released by removing a single nut. Units are of the continuous type and have return bends formed integral from the tubing. The superheater provides steam at a temperature of 600 degrees Fahr. at the throttle under normal operating conditions.

The extension of the use of highly superheated steam is shown by the fact that there are now more than 2,200,000 horsepower of marine engines receiving highly superheated steam from superheaters which are of the fire-tube type.

STEAMER PEARL SHELL

This vessel is an excellent example of an eastern built cargo vessel. She was built for the Shell Oil Co. of California and taken over by the government.

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Marine News in a Personal Way

Intimate Gossip About What Leaders in the Maritime World Are Doing

JOHN F. BLAIN was recently appointed district manager of ship construction for the state of Washington. He now has complete supervision over government shipbuilding, both wood and steel, in the Seattle district, which includes all yards in Washington and on the Columbia river. Until Mr. Blain's appointment, the shipbuilding program in this district was under the direction of WILLIAM PIGCOT, who was known as district supervisor of wooden ship construction. Mr. Piggot tendered his resignation some time ago.

* * *

WILLIAM W. LOCKE has been placed in charge of ship construction at Hog Island by the American International Shipbuilding Corp. to succeed WALTER GOODENOUGH, who has been transferred to the Boston offices of Stone & Webster, builders of the Hog Island yard.

* * *

WILLIAM ROGER has become plant and maintenance engineer of the Halifax Shipyards, Inc., Halifax, N. S. Previously to his appointment, he was superintendent of the Star Mfg. Co., Dartmouth, N. S.

* * *

FRANK A. MULHAUSER, Cleveland, who for the past year has had charge of the employment and service section of the Emergency Fleet corporation in the Great Lakes district, has been transferred to Philadelphia where he has undertaken the same work on a larger scale.

* * *

N. C. AUBURN, Emergency Fleet corporation inspector at the Grant-Smith-Porter shipyard, Aberdeen, Wash., has been transferred to the Wright shipyards, Tacoma, Wash. GEORGE KNIGHT, who has been his assistant, succeeds him as resident inspector of the Aberdeen yard. Mr. Auburn came to the Grant-Smith-Porter yard May 15 from Raymond, Wash., where he was connected with the Sanderson & Porter Co.

* * *

WILLIAM S. YOUNGMAN, Boston, was recently appointed assistant director of plant protection of the Emergency Fleet corporation.

* * *

H. D. MEGARY has been elected secretary of the Chicago Pneumatic Tool Co., Chicago, to succeed W. B. SEELIG who has resigned.

* * *

W. H. PHILLIPS has been elected president of Devoe & Raynolds Co., Inc., New York, manufacturer of paints and varnishes. Mr. Phillips has devoted 35 years to the paint and varnish business and his knowledge is based on practical experience. He spent the first eight years of his business career in the Devoe factory after which he traveled for the company. Later he became its sales manager. In 1914, he was elected director of the company and assumed the duties of general manager.

* * *

DELOS W. COOKE has been elected associate director of the Cunard, Anchor and Anchor-Donaldson lines. At present, Mr. Cooke is fuel administrator for the state of New York. He was vice president of the Erie railroad until recently. Mr. Cooke's entire time, however, until the end of the war will be devoted to the fuel administration, exports control committee and other war work on which he is now engaged.

* * *

R. E. WHEELAN has been elected vice president in charge of steamship operations of the Potter Steamship Co., Inc., New York.

* * *

R. H. WILSON has been appointed assistant to the president of the Walter A. Zelnicker Supply Co., St. Louis. Mr. Wilson has been connected with the company for many years, latterly as representative at Houston, Tex.

* * *

ROGER C. SULLIVAN has been appointed a director and elected chairman of the board and also a member of the executive committee of the Independent Pneumatic Tool Co., Chicago, to fill vacancies caused by the death of John P. Hopkins.

* * *

A. M. BROWN has been appointed district manager of sales for the Philadelphia branch of the Chicago Pneumatic Tool Co., succeeding G. A. BARDEN, who remains in Philadelphia as sales representative for the company. For some time past Mr. Brown has been located in the company's New York offices as assistant manager of the compressor sales division.

* * *

HOMER C. JOHNSTONE, who is connected with the firm of Gaston, Williams & Wigmore, Inc., New York, as manager of the steel department, has been elected a member of the New York metal exchange.

* * *

ANDREW P. MURTHA has joined the force of the Overseas Underwriting Agency, Inc., New York, as one of its underwriters. For many years Mr. Murtha was connected with the marine department of the Aetna Insurance Co. Previous to his connection with the Aetna company, Mr. Murtha was connected with the United States Lloyds.

* * *

JOSEPH S. STULL has been appointed superintendent of the Pennsylvania and New Jersey shipyards of the Pusey & Jones Co., Gloucester City, N. J., to succeed the late Hugh V. Ramsey, who died recently.

* * *

J. H. MCCALLUM has been elected vice president of the Pacific Coast Association of Port Authorities. Mr. McCallum is harbor commisioner of San Francisco.

* * *

WILLIAM L. OSBORN has been appointed agent of the Scandinavian-American Line in Philadelphia with offices in the Lafayette building.

* * *

CAPTAIN JOHN O'NEILL, after being in the service of the Clyde Steamship Line for a period of 42 years, has been placed on the retired list of that company.

* * *

H. L. HUDSON, general agent of the Union Pacific with headquarters in Seattle, has resigned to take charge of the shipping department for Rogers Brown & Co., of that city, one of the largest importers of vegetable oils in this country. Mr. Hudson is thoroughly versed in traffic matters and his appointment, dating from Nov. 15, testifies to Seattle's growing oil trade.

* * *

H. A. KIMBALL has joined the traffic department of Mitsui & Co., large importers of Oriental merchandise, with headquarters in Seattle.

* * *

ALBERT SMITH, general manager of the Eastern Steamship Lines, Inc., with offices in Boston, has resigned.

* * *

GUY E. TRIPP, formerly colonel, United States army, and head of the production division, has been made a brigadier general of the United States army, and placed in offices having charge of the production of ordnance material in various sections of the country. The district chiefs will report direct to Gen. Tripp, who is succeeded as head of the production division by Col. C. C. Jamieson. Previous to his connection with the ordnance department, Gen. Tripp was chairman of the board of directors, Westinghouse Electric & Mfg. Co.

* * *

H. B. WALKER has been appointed federal manager of the coastwise steamship lines with offices at Southern Pacific pier 49, North river, New York. Mr. Walker will have jurisdiction over all departments of the following coastwise steamship lines now under federal control: Old Dominion Steamship Co., Ocean Steamship Co., Southern Steamship Co., Merchants & Miners Transportation Co., Mallory Steamship Co., Clyde Steamship Co., Southern Pacific Steamship Co. and the Atlantic Steamship lines.

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Photographs From Far and Near

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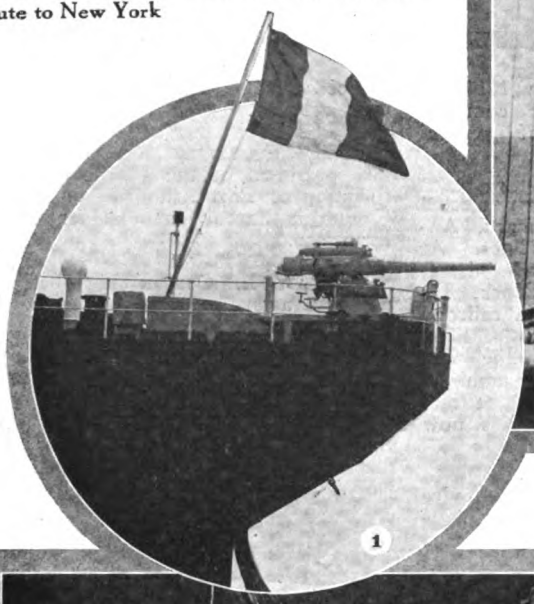
The 65-millimeter gun aboard French liner Guyane that sank a German submarine en-route to New York



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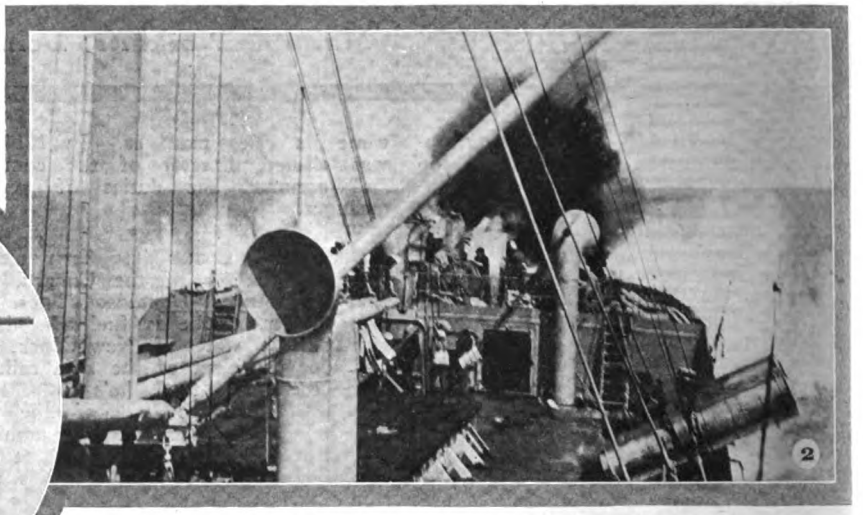
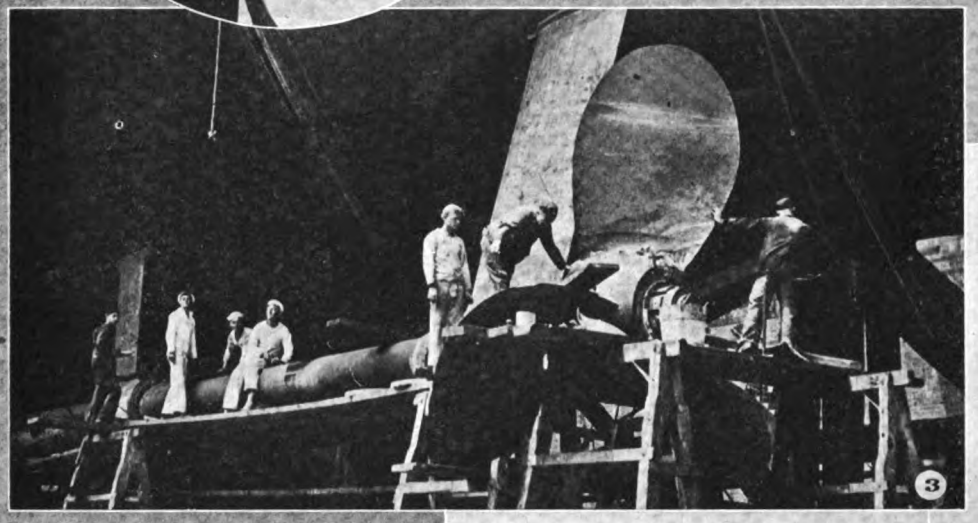


2

Torpedoed! The "most remarkable marine photograph of the war," snapped by an amateur aboard the steamer at the moment she was hit by a torpedo fired from a U-boat.

New York's nautical schoolship Newport, aboard which the "Jackies" are trained for merchant marine or naval reserve officers.



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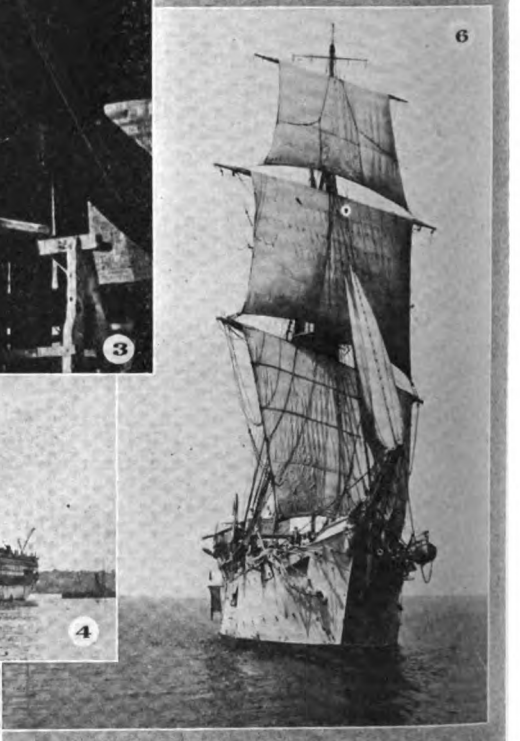
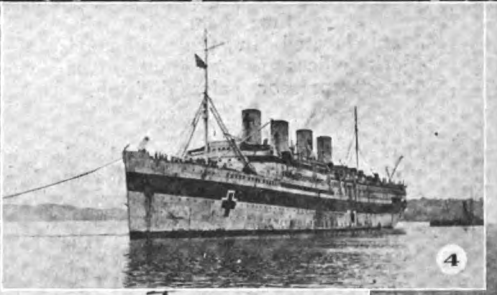


6

Above—Repairing propeller of one of Uncle Sam's mighty dreadnaughts. At right—How Red Cross hospital ships are marked.



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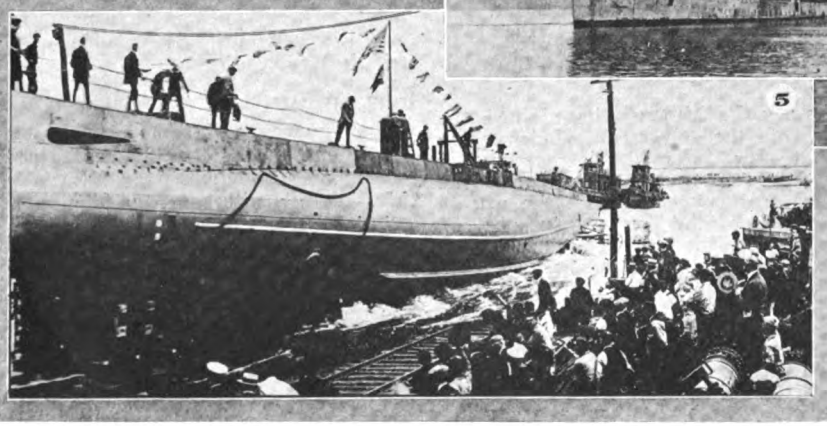

5

One of our "R" boats taking its initial dip. This submersible, the R-21, recently launched, represents a type of the most modern American undersea craft.

(Photos 1, 3, and 6, © International Film Service; 2, Underwood and Underwood; 5, com. on public information)

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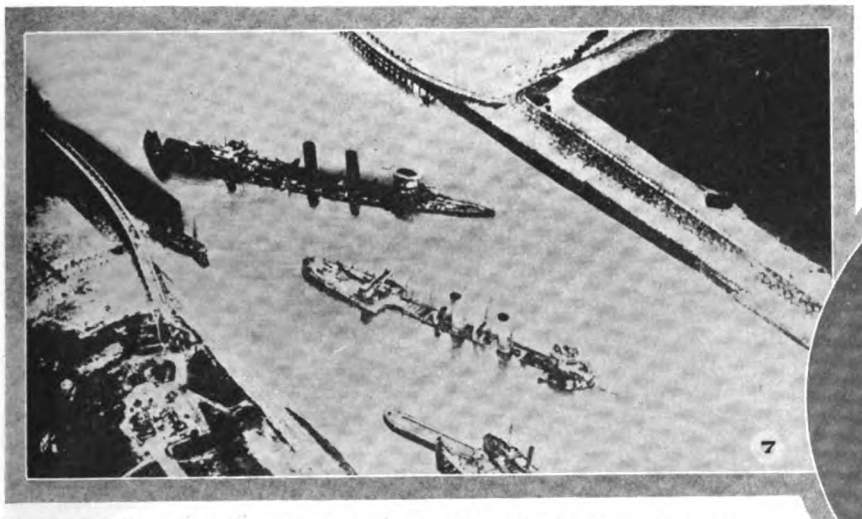
Latest Marine News in Pictures

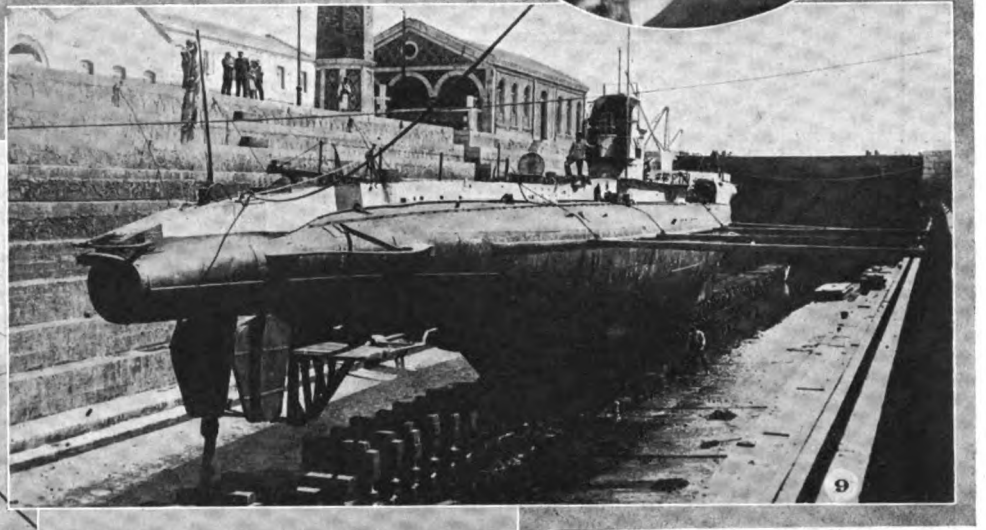
Payment Will Be Made For Acceptable Photographs



German photograph of British ships which were sunk in Zeebrugge canal to bottle up U-boats. The photograph was taken by an aviator when the tide was low, the ships being completely hidden at other times.

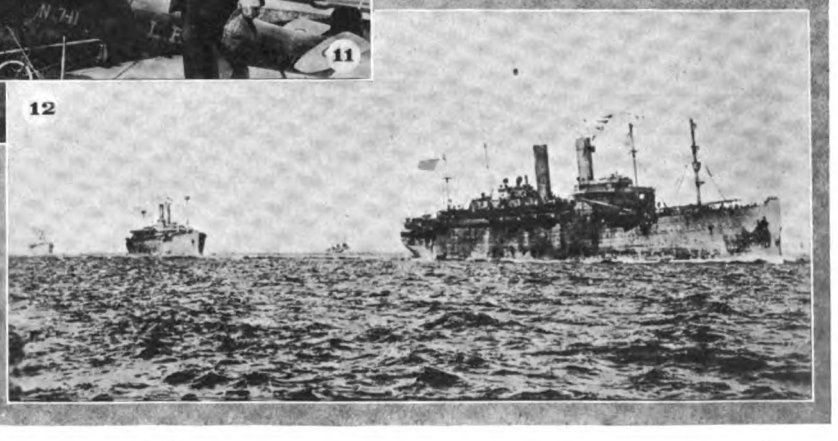
Sir Eric Geddes, first lord of the British admiralty, one of the real supermen of the War.

Testing new "canon ball" diving bell by means of which pontoons are to be attached to sunken ships to raise them from the depths.



German submarine U-56 interned in Spanish port of Santander, drydocked to permit Germans to make repairs.

To keep this steady stream of transports moving toward France the "ace" in the airplane, J. J. Higgins, chief engineer, Interlake Steamship Co., is here shown selling a Liberty bond to one of the crew of the steamer Lagonda.



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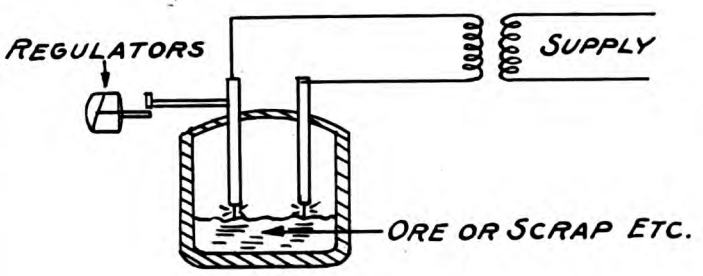
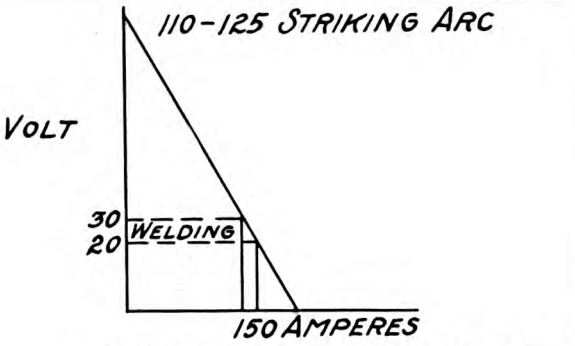


FIG. 1



AC RESISTANCE OR REACTANCE

FIG. 2

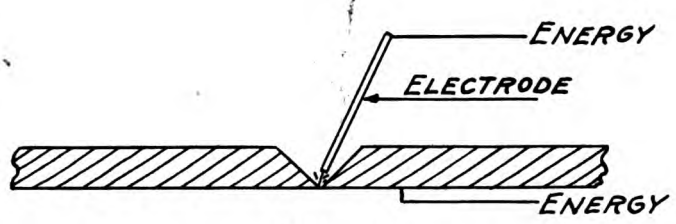
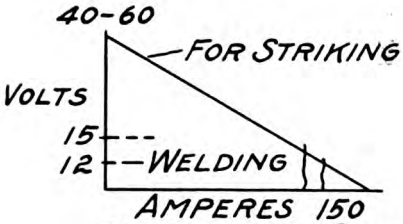


FIG. 3



DC CONSTANT POTENTIAL
40 OR 60 VOLTS, RESISTANCE REGULATION

FIG. 4

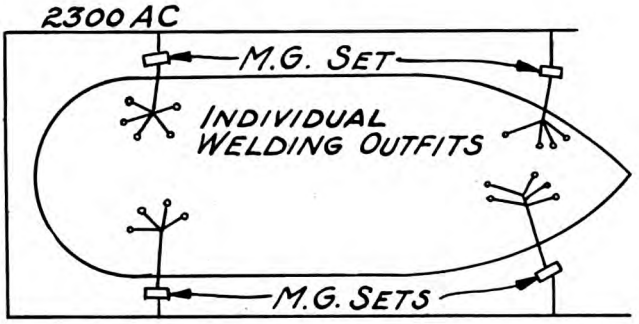


FIG. 5

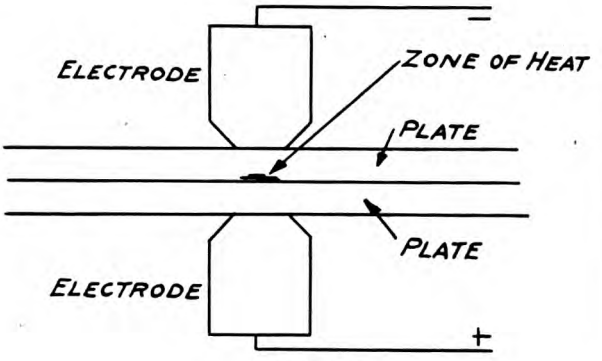


FIG. 6

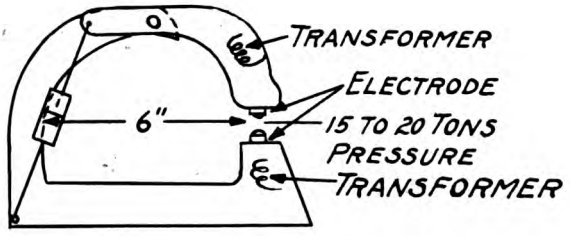


FIG. 7

FIG. 8

MIXTURE OF ELECTRODE MATERIAL & PLATE METAL, VARYING FROM 100% PLATE TO 100% ELECTRODE

FIG. 9

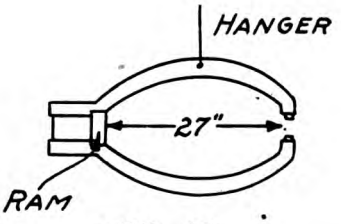


FIG. 10

FIG. 1—GENERAL TYPE OF ELECTRIC FURNACE. FIG. 2—CHART OF RESISTANCE OR REACTANCE. FIG. 3—SIMPLE FORM OF ELECTRIC WELD. FIG. 4—BASIS FOR COMPUTING CAPACITY OF LINES. FIG. 5—ARRANGEMENT OF DISTRIBUTING SYSTEM. FIG. 6—ELECTRIC SPOT WELD. FIG. 7—HEAVY MACHINE FOR SPOT WELDING. FIG. 8—INCORRECT ELECTRIC WELD. FIG. 9—CORRECT ELECTRIC WELD. FIG. 10—MACHINE FOR SPOT WELDING HEAVY PLATES

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Tools Used for Electric Welding

The Basic Principles of Electric Welding Are Defined and the Various Types of Appliances Used Are Described

By W. L. Merrill

BEFORE discussing the tools and the methods of producing welds, it may be well briefly to go into some of the fundamental principles of the processes of arc and spot welding, since, at the present time, these types of welds are the most important so far as making progress in the shipbuilding program.

In a sense, arc welding is different from blacksmith welding, or spot welding, or welding where no additional metals are used for filling purposes, and is well illustrated in the principle on which the electric furnace is operated. In Fig. 1 is shown a general type of such a furnace, having two electrodes. Here we have the furnace charge consisting of scrap iron, pig iron, iron ore or other metals, the source of electric supply, and the regulators for maintaining a definite current.

There are many types of these furnaces in use, but, regardless of the type, there is but one object to be accomplished, that is, to put heat in the charge, bring it to temperature, refine it, and make it into a molten state to produce castings. The accomplishment of this object in the electric furnace is brought about by the application of the same principles and instruments used in arc welding, with the difference that in the furnace carbon is used to conduct the current down to the metal, whereas in arc welding a metal electrode is employed, the end of which melts as the heat becomes intense enough to fuse the metal.

Simple Kind of Weld

For illustration, let us consider a most simple kind of weld; say two pieces of steel plate, as shown in Fig. 3, which are to be joined together. In this case the plate becomes one side of the welded surface, while the material added to fill the gap between the plates forms the other side. As the arc is started and heat produced, the sole object is to create a miniature arc furnace, supplying the material by hand in the same way as the regulator on the furnace runs the electrode down and maintains a definite length of arc. If the currents are not properly adjusted; if the apparatus is not arranged so as to give the proper welding conditions, or the operator unskilled, a weld will be produced in most cases like the one shown in Fig. 8. There will be no difficulty in filling up the groove with molten metal, but a section cut through the weld will, in most cases, show a cleavage, even to leaving the original tool marks visible. Although this is not a weld, there is some adhesion and more or less strength. To weld properly, however, the operator must start at the bottom of the groove, and, by alternately filling in and then melting a little metal at a time, continue in this manner until the gap has been entirely filled as shown in Fig. 9.

Second of a series of lectures on "Electric Welding" held at the Engineers' club, Philadelphia, under the auspices of the United States shipping board and published in *The Journal* of the Engineers' club. The author is engineer of the power and mining department, General Electric Co., Schenectady, N. Y.

Arc Welding Tools

Understanding, then, the conditions for which we are striving, and bearing in mind that there are really only three tools for arc welding, let us see what we have to start with. Of these tools, first in order is the source of current; second, some transforming or control device to control the current within necessary limitations; and third, the skill and brain of the operator. In estimating roughly the worth of these tools, I would valuate the current and controlling device at 10 per cent, and the skill and brain of the operator at 90 per cent, and accordingly I consider a most important factor in this industry the cooperation schools, since in these schools welders will be trained who can do entirely satisfactory work with the tools supplied them.

Successful welding can be done with both alternating and direct current, and both systems have their advantages. In general, however, local conditions, such as the kind of current with which the shipyard is supplied, together with the location of the welding operations, that is, whether done in the shop or field, may well be the determining factors.

In the case of shop welding, where the operators are close together, the work is brought to the welding apparatus rather than the apparatus to the work. It would seem to be folly to transform from direct current to alternating current or *vice versa*, but there are limitations which must be considered. If a considerable number of welders are to be employed, welding directly by alternating current, the low power factor of the load must be taken into consideration with the supply system; and while it would be folly to transform from direct current to alternating current, it might be necessary to transform from alternating current to direct current for any considerable number of welders. In such a case, only by a study of the conditions prevailing, and the ability of either alternating current or direct current equipment to meet these conditions, can the choice of current be determined.

Distribution Systems

If we bear in mind that a low voltage is used in carrying on any welding operation—a voltage ranging from 12 to 15, using direct current, and perhaps 20 to 30 using alternating current—it will be realized that the matter of distribution over a ship becomes somewhat of a serious problem. If a central station be placed near the ship to transmit the current at these low voltages to the required points, it will mean that the cable supply will be in the way, and present probably even a more serious fault than does air hose at the present time. From an engineering standpoint, also, it would be unpracticable to distribute at these low voltages, so that it is necessary to arrange some device by which it is possible to divide the power into different sections.

One system that has been worked out and will probably be installed in one of the larger yards, where a voltage of 2200 is used to start with, is shown in Fig. 5. Here four 60-cycle motor-generator sets, each having a potential of 60 volts and a resistance to reduce that voltage wherever the men happen to be working, are employed. Each motor-generator set has a capacity equal to one-fourth that required by the total number of welders, which in this case is about 60, and therefore distributes 15 operators over each section.

Another system that can be used requires, from the nature of the system, 125 volts direct current to start with, so that in case the yard were supplied as above with 2200 volts alternating current it would be necessary to transform from 2200 to 125, each welder down in the ship having his own motor-generator set.

Another Practicable System

Still another system which can be used—and is being used, by the way, in some yards—consists of leading up to some convenient deck on the ship with 2200 volts and there reducing through a static transformer, to, say 440 volts alternating current instead of reducing to 125 volts direct current. In this case motor-generator sets for each welder reducing from 440 volts alternating current to 40 or 60 volts direct current would be used.

A still further system consists of a reduction to 110 to 125 volts alternating current, then running with dead resistance or reactance, and welding directly with alternating current.

Due to some peculiarity in striking the arc, it becomes necessary to start with 110 volts, or a little over, in the case of alternating current, while with direct current, 40 to 60 volts are all that are necessary. Therefore ,assuming that the current required in either alternating current or direct current welding is the same, we see that a basis may be had for computing, in each case, the capacity of the lines. See Figs. 2 and 4.

Of the other tools, such as electrode holders, and masks for the protection of the operators, little need be said. There are many of these devices in use, each of which is doing good work in the railroad shops and other places

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where electric welding has been used for a number of years. It is hoped that some of the best ones will be chosen and standardized for ship work.

So far as electric welding is concerned, spot welding is one of the oldest arts. It has been used for many years in the welding of thin plates up to a thickness of ¼ inch, and recent experiments have shown it feasible to spot weld in one operation as many as three 1-inch plates.

The action which takes place in the spot weld is practically the same as that which takes place when a blacksmith makes a weld. The plates are put under a heavy hydraulic or air pressure, and an alternating current at high density sent through them by means of electrodes located immediately above and below the area under compression. See Fig. 7. As the current heats up the contact area of the plates, see Fig. 6, this area becomes plastic and the pressure squeezes the surfaces together. While in that condition they cool. First the current is taken off, then the pressure and the weld is complete.

Spot-Welding Tools

So far as shipbuilding is concerned, the extent to which spot welding may be commercially applied has not yet been determined. Three experimental machines are, however, being built at the present time for the Hog island yard by means of which it is hoped the limitations of spot welding in this field may be ascertained.

Fig. 7 shows one of these machines, a heavy welder, with a capacity of 15 to 20 tons pressure, which will have about a 6-foot gap. With this machine we expect to fabricate by spot welding, with no previous work except the cutting, such portable structures as deck houses, which are now being put together in the shops by riveting.

The second machine, Fig. 10, which is being built on exactly the same principle, but for another purpose, is to be used in making up the floors. With this machine it is hoped that, when the plates and angles have to be assembled, it will be possible to go around them and spot them together in the same way as is now done with a bull riveter. While it is not thought possible to fabricate this work as quickly by spot welding as by riveting, it is nevertheless expected to show a saving in the total time required when all the work preliminary to riveting is taken into consideration. Even marking with a punch may be eliminated, where numbers of pieces of the same size and dimensions are welded, if, as is expected, a method of clamping may be worked out.

The third experimental machine, now being built, s exactly like the second, and of the same capacity but of a smaller size. This machine will be used for smaller work where the throat of the other machine is not necessary, and it is expected that there will be a large field for its use in putting on fishplates, angles and other structural shapes.

From these machines it is expected to obtain data showing comparisons in labor, cost and time between riveting and spot welding. If, as confidently expected, these comparisons are favorable to spot welding, it will mean that the material can go directly from the shears to the welders without any previous punching either in the fabrication shops or in the shipyard.

What Peace Means to U. S. Shipyards

(*Concluded from page* 527)

cessful ship operators of America before the war, and he has contributed his ability to the service of the government since early in the emergency. Whenever a question arose as to the proper trades to which a requisitioned vessel or a newly constructed vessel should be assigned Mr. Franklin was consulted. It was upon Mr. Franklin's expert recommendations that specific ships were designed for particular uses.

It is understood that many vessels were altered in their structural arrangements upon Mr. Franklin's advice to make them better fitted for the work imposed upon them. Proper disposition of the new wooden ships was rightly a matter for reference to Mr. Franklin, and it is but reasonable to presume that he will have much to do with the ultimate fate of this type of vessel. When Mr. Hurley declared that it is the intention of the government to build ships from now on with an eye to the future needs and for peace trade, the assumption was that he had in mind a revision of the building plans to meet these needs. And those building plans were predicated upon the recommendations of Mr. Franklin as to the types of ships which are immediately needed and the types which are likely to prove commercially successful in after-the-war trades.

1919 Contracts Untouched

Contracts for 1919 delivery have not as yet been altered. Steel requirements for these vessels will be out of the rolling mills by the end of the second quarter of next year. By the end of the third quarter, it is planned, all of the odd sizes will be on the way to the yards. Commitments have already been made for this material. In the meantime, however, the requirements for the 1919 shipbuilding program will be out of the way in ample time to determine upon the 1920 ship needs. An early peace makes possible immediately some radical alterations more in the design of merchant ships than in the quantity of tonnage.

Peace will make it almost obligatory to reduce the number of shipyards and the number of ways. In all England are but 209 ways, and England has for years held the supremacy in shipbuilding. Even the great emergency of war has not increased England's shipbuilding ways any more than this. On the other hand, the shipping board lists out 810 ways in the United States available for merchant ship production, exclusive of the old and experienced American yards whose ways are still completely occupied with new navy vessels. This is a tremendous advantage over England, it would seem, and yet the production of ships here has but slightly exceeded England's output. Practical shipbuilders in America, the men who have had many years of experience, well realize that there has been much mushroom growth which is often detrimental.

"We are only now beginning our progress of ship construction," Mr. Hurley reassured. "The removal of the emergency cannot and will not bring an end to the world's need for ships, nor prevent us from carrying out our program to a successful conclusion. We shall continue to use all the facilities of shipbuilding that business economy will permit.

"On the other hand, the government expects to continue to supply material and direct the vast energies now devoted to shipbuilding. The end of the war will mean only the removal of the menace which confronted the world's shipping; it will not and cannot mean the immediate elimination of the need for ships.

"To take advantage of this established industry and restore to the world its lost tonnage is a natural and business-like procedure.

Fighting U-Boats on the Great Lakes

(*Concluded from page* 533)

the yards were forced to the expediency of establishing schools and educating the men to such work as riveting.

Similar conditions have not existed on the lakes except in a small degree. It is true that the lake yards also had contracts to build navy vessels. The lake yards have built many of the submarine chasers, for instance, and other small vessels. Today Henry Ford has in operation his famous new plant to build a special type of destroyer for the navy. This plant represents some novel ideas in shipbuilding methods.

Some shipyards throughout the country have been striving for records in shipbuilding. These yards, it has been recounted by officials of the shipping board, early adopted the policy of offering higher wages than neighboring yards in order to draw away all of the most experienced workmen. The results were extremely disquieting as the unrest developed, quickly spread. It required considerable time to put to rest all of these labor troubles.

Little of such rivalry has existed on the lakes. The shipping board now controls wages in all shipyards and a considerably reduction in the labor turnover naturally follows. The lesson in co-operation, and in harmony of purpose between the various shipbuilding yards on the lakes is one that deserves the widest publicity. Its application includes not only the shipbuilding industry but other industrial undertakings. It is a lesson taught by the war.

Great Lakes builders have cause to feel proud of the record they made this season. It was due to a get-together spirit prompted by the consciousness that there is a big job ahead. This spirit was encouraged by the officer in charge of the district, Henry Penton. He was selected by the executive officers of the Emergency Fleet corporation because of his known ability and reputation of character, for his courage and fairness. The selection has proven entirely satisfactory as the record of the lakes this season so ably attests.

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In the Traffic Manager's Office

A Review of the Month on Coasts and Lakes—Useful Pointers for the Men Who Get the Business

German Shipping Ready for Peace

ALL the time Germany has been trying to confound her enemies and even while dickering for peace, she has been quietly going about her schemes of restoration of her merchant fleet. How mighty that fleet will be and how potent a factor in the world's trade may prove a great surprise to an unsuspecting world. Reports coming from Germany are too often rife with propaganda shrewdly planted by the imperial German government, and yet it now appears that the agents of the allies have at hand sufficient actual facts to indicate that the restoration of the German merchant fleet is out of the dream stage and approaching a reality.

It was undoubtedly this realization which recently prompted the council of the chamber of shipping of England to send a petition to the British government. This council declared that German merchant ships should not be set free after the war "to extend their share of the world's carrying trade, and so profit by the losses which their government, by means mainly piratical, had inflicted upon the ships of the allies." The allied countries will find themselves short of tonnage at the end of the war despite the production records now being made. This shortage is due entirely to Germany's illegal acts and it was insisted that Germany should be compelled to make restitution to the extent she is capable by actual transfer of her present merchant ships.

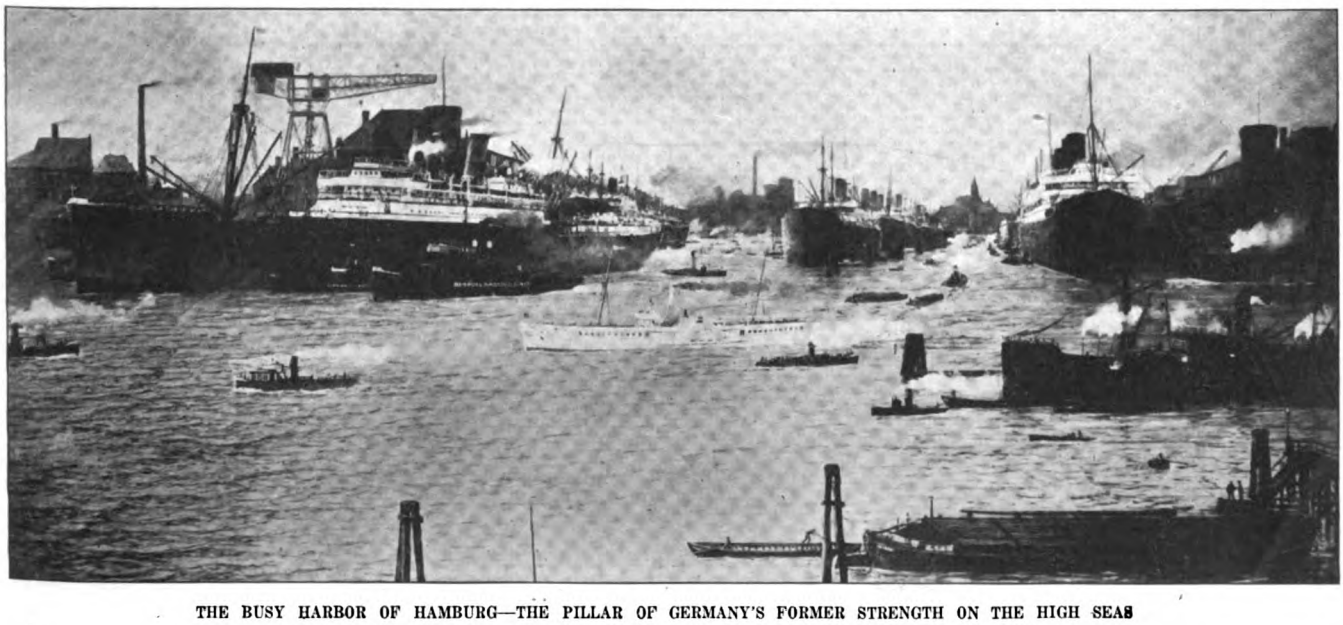
While armistice negotiations were being carried on Germany remained silent in regard to the merchant tonnage question. Furthermore Germany is not willingly divulging the extent to which her own tonnage losses have been recouped preparatory to the return of peace.

Presents Pressing Problem

"The restoration of the German merchant marine," recently declared an announcement of the department of commerce, in speaking of conditions existing in Germany, "is naturally regarded as one of the most pressing problems in the work of reconstruction," And again this announcement stated: "It is the intention of the government to interfere as little as possible with the business methods of the shipping firms, but government tonnage will be reserved principally for essential imports, the degree of urgency of demand to be the determining factor in the allotment of shipping space to various products. This control is to be exercised through an organization representing the shipping firms and entrusted by law with the exercise of certain functions in regard to the use of ships and the sanction of charters The government is to be represented by an expert commissioner from the ministry of economics. The plan also calls for state intervention in the important question of freight rates."

This plan of control of shipping to safeguard the economic life of the country is but indicative of the way in which the German government goes about the problem. It is predicated upon the fact that Germany is not entirely destitute of merchant tonnage as is popularly supposed in certain quarters of the world. Fearing that the government may make the earnings of the steamship lines secondary to internal economic conditions, already the German shipping interests are reported to have raised a protest. The commercial interests of Germany are perturbed over the government's plans for reconstruction. The central organization of the German wholesale trade has started a propaganda for the protection of that trade after the war. The Hamburg chamber of commerce has addressed a memorial to the imperial commissioner for transition economy, demanding that commerce be restored to its former position and afforded facilities for resuming its old connections. At a special meeting called by the chamber about the middle of 1917, the American government is informed, fear was expressed that in the reconstruction program commerce may be subordinated to industry.

It is patent that this movement in domestic politics in Germany would not have been prompted if Germany did not possess the means of engaging



THE BUSY HARBOR OF HAMBURG—THE PILLAR OF GERMANY'S FORMER STRENGTH ON THE HIGH SEAS

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in commerce, the ships. Various reports, most of which are unofficial it is true, have been received in the United States, indicating the activity in German shipbuilding yards throughout the four years of the war. Herr Ballin of the Hamburg-American line gave an interview in June, 1916, indicating the number of ships which had been completed or ordered to replace German merchant vessels sunk or captured at sea, or seized by her enemies. Mr. Heineken of the North German Lloyd since then has given some similar information. Just prior to the war Germany had on the ways 104 merchant vessels of 810,520 tons. These included 21 large vessels, totaling 385,000 gross tons, or nearly one-half of the total, being built in German yards on behalf of the Hamburg-American line and the North German Lloyd for their passenger and emigrant traffic to North and South America. They were scheduled to be named after the warlords of Germany: BISMARCK, TIRPITZ, ZEPPELIN, BURCHARD, HINDENBURG.

The figures include 83 cargo vessels totaling 425,520 gross tons, of which six, amounting to 40,000 tons, were intended by the North German Lloyd to be put into its trade with Australia, and seven others, amounting to 56,000 tons, to be put into the trade with the Far East. These facts were collected by the British and therefore the tonnage statistics are given in the gross whereas the United States shipping board estimates in deadweight. The 810,520 gross tons reputed to have been under construction in German yards at the outbreak of the war, would represent some 1,300,000 deadweight tons. There is good reason to believe this tonnage has been completed and more in addition.

Provides Large Subsidy

The imperial German government was responsible for the ship subsidy act of Nov. 7, 1917, which empowered the chancellor to grant subsidies to proprietors of German merchant vessels lost or heavily damaged as a result of war. It was stipulated that the vessels replaced with the aid of a government subsidy must either be turned over by the owner to the state or the owner must bind himself to repay the subsidy at the rate of 5 per cent annually. The law forbade the sale of such a vessel to a foreigner within 10 years of its re-entry into service except with the consent of the state. The consent of the state is also required for charters and freight contracts with foreigners. The administration of this law was placed in charge of the imperial committee for the reconstruction of the merchant marine (Reichsausschuss fur den Wiederaufbau der Handelsflotte). Regulations for procedure thereunder were issued by the bundesrat in February, 1918.

Companies Obtain New Capital

Most of the German steamship companies have increased their capital stock with a view to rebuilding their fleets. This was done despite the fact that these large companies were not earning sufficient to pay dividends by reason of their inability to engage in overseas trade. The imperial German government has assisted by releasing these companies from the obligation to publish their balances. Before the war the Hammurg and Bremen companies, which comprised nearly nine-tenths of Germany's entire shipping trade, were paying a dividend of 5 to 6 per cent. During the war they have been operating at a loss. Despite this lack of income the government has taken steps to protect these influential companies in order to prevent them going into bankruptcy.

Not all of Germany's shipping has been in such dire need. This has been received via Copenhagen:

"The war years 1916 and 1917 have been more favorable for the smaller owners in North sea and Baltic trade, most of which are domiciled from Elensburgh to Konigsberg. They have done good business in German and Scandinavian coast trades, especially carrying ore. In 1916, 15 to 20 of these owners paid a dividend of between 5 and 20 per cent, and in 1917 between 10 and 40 per cent.

"The shipbuilding industry also has had wonderful years, while before the war it was in quite a tight position. Without competition the German shipyards are now building almost exclusively for the navy, and orders for construction after the war are accumulating. Shareholders, who before the war had to be satisfied with a 5 per cent dividend at the most, now get 10 to 20 per cent, in spite of the large amounts for depreciation and extensions. Besides the 22 old shipyards, 14 new ones have been built and six or seven more are planned."

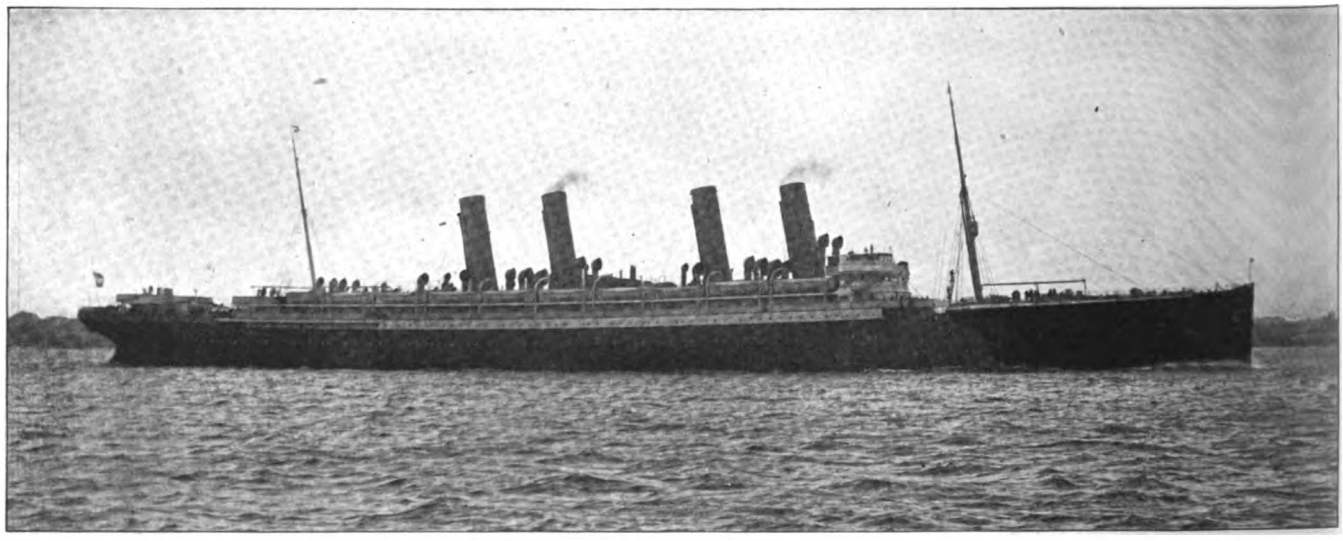
Germany's merchant marine in 1914 was 4,892,410 tons; in 1915, 5,516,088 tons, and in 1916 it was 4,463,842. That does not appear as though England and France were successful in destroying absolutely Germany's hope of regaining her prominence in world commerce. Then the United States came into the war and took over the German merchant vessels which had sought refuge in our harbors at the very beginning. That decreased the tonnage some but not materially if it is true, as reported, that the Germans have been dropping new tonnage from their ways throughout the duration of the war.

The sum total of enemy ships taken over by the United States was but 100 ships having an aggregate deadweight of 644,713 tons. That subtracted from the apparent merchant tonnage of the Germans and Austrians would leave a very respectable fleet to begin the restoration period with. These figures may exceed the British estimate of the German merchant tonnage today. The shipping board said 3,795,000 deadweight tons of enemy ships were captured up to Sept. 1, 1918. The British estimate conservatively that the present German tonnage is approximately 2,000,000 gross.

New Tonnage Being Built

It is not believed in America that Germany has stopped entirely the building of new merchant tonnage since she went to war. As a matter of fact the evidence is to the contrary and it is made to appear that the whole scheme has been one well calculated to wrest from her competitors her old-time supremacy and even to increase it in the world's commerce.

Considerable difficulty has been encountered in obtaining accurate data



A GERMAN LINER. IT IS IN THIS TYPE OF SHIP THAT THE GERMAN FLEET IS ESPECIALLY STRONG

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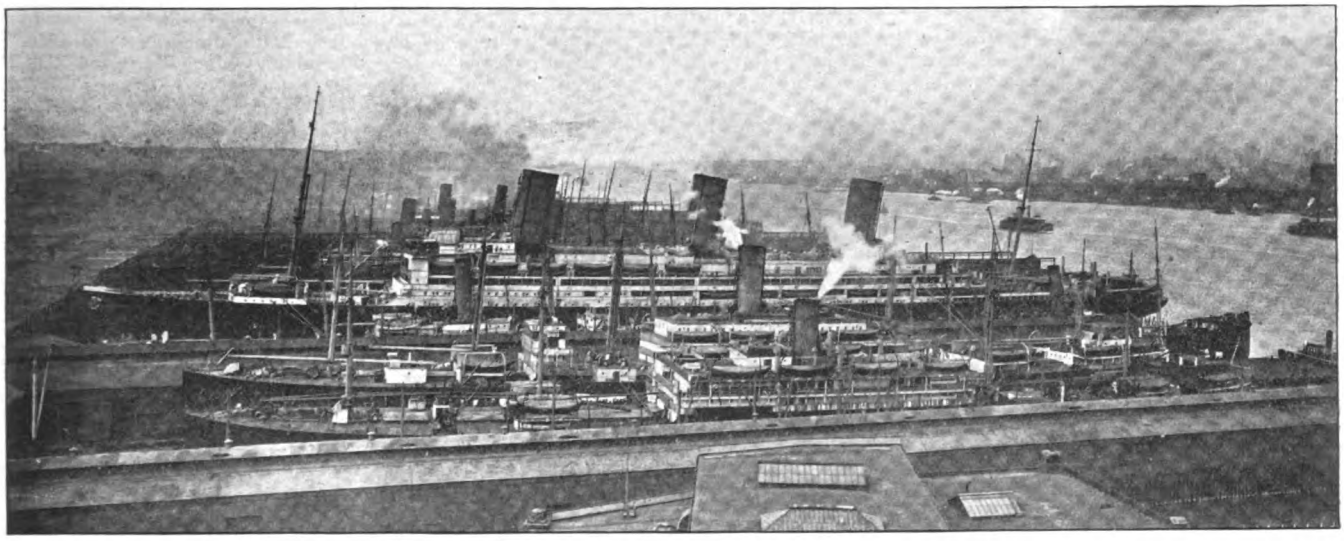

A FEW GERMAN MERCHANTMEN IN PORT. THE COMPANIES OWNING THESE ARE NOW INCREASING THEIR CAPITAL

on the amount of subsidy that the German government intends to grant under her new reconstruction act. Neither can the amount of tonnage that will be built thereunder be estimated, although $250,000,000 has been hinted at as the total amount of subsidy. The vessels built under this war subsidy will be required to carry cargoes of raw materials to Germany, and export her manufactured products to help re-establish German credit abroad. The government has put a stop to and cancelled all contracts with subsidy vessels for the carriage of goods which had been in effect since Dec. 1, 1916.

Adjudications under the terms of peace will be a determining factor in Germany's case and it is with the full knowledge of this that the imperial German government is striving for a peace which will leave her a free hand that she once more may embark upon her scheme of dominance of the world trade. Peace now would not greatly cripple her in this ambition. As a matter of fact it would enable her rapidly to restore her merchant fleet.

Powerful Export Company

With this possibility in mind a powerful export trade organization has been organized in Germany. It is known as Aktien-Gesselschaft fur Inund Auslands-Unternehumngen, patterned evidently after the British Trade corporation and the American International Corp. It is capitalized at 25,000,000 marks and is to undertake the construction and operation of railroads, irrigation plants, harbors, electric plants, as well as factories; to operate plantations and mines; and to form and participate in subsidiary concerns.

Among the firms interested in this new German corporation is Hugo Stinnes (Ltd.), the same Hugo Stinnes, it is understood, who fathered the Richard G. Wagner enterprise in America. He tried to disguise his German ships under new names, obtain American registries and thereby keep them in profitable employment until after the war and Germany would need them again. When the alien property custodian took over the Wagner ships, because they were enemy property, it was disclosed that not only had the Germans been striving to put their existing ships in service under the protection of neutral flags but that they also were building new tonnage in German yards for this same purpose.

The German export trade organization has directors from the Norddeutsche bank, Dresdner bank, the Hamburg-American line, Hugo Stinnes (Ltd.), Rheinish-Westphalian Coal syndicate, Krupps, and Siemens & Schukert. In addition, it is reported, there has been some movement in trading circles for the establishment of a special bank for export trade, on the ground that after the war the smaller German concerns may be unable to get the acceptance credits they formerly enjoyed in countries now at war with Germany.

German bankers are nevertheless preparing to take care of the requirements of the trade of their country, as is evidenced in the many banking amalgamations effected during the war. The Deutsche bank has absorbed the Schlesischer Bankverein and the Norddeutsche Kreditanstalt. This amalgamation, it is felt, was for the purpose of extending the sphere of activity of the Deutsche bank into the eastern provinces of Silesia, Pomerania, Posen and East and West Prussia. As a result of this invasion of the eastern provinces by the Deutsche bank, the Danzinger Privatbank has entered into closer relations with the Berliner Handelsgesellschaft.

Banks Prepare for Peace

According to more recent reports the Disconto-Gesellschaft is taking over five provincial banks in central and western Germany, which is regarded as a continuation of the policy underlying the absorption of the Schaffhausener Bankverein in 1914 and of the Konigsberg Bankverein in 1916. The Dresdner bank, it is said, has greatly improved its representation in the Rhineland and Westphalia by the absorption of the Rheinisch-Westfalische Disconto-Gesellschaft in Aix-la-Chapelle, with a capital of 95,000,000 marks and valuable connections in textile and other industries. The war has, it would appear, closely allied if not amalgamated the various industrial and financial factors in Germany and that will give the Germans a greater recuperative force when the war is over. There have been advocates of building a large canal connecting the Rhine and Danube rivers inasmuch as it has appeared that Germany's industrial strength will lean in that direction for some years to come. This project has been spoken of as the Danube-Main canal, and a company for its construction has been organized known as the Aschaffenburg-Nurnberg-Passau. It was organized in December, 1917, with a capital of 5,000,000 marks, and a board of directors on which the German empire, Bavaria and Baden are represented. This projected canal is intended for large vessels.

Gets Ready for Trade

Another project which has been frequently mentioned is the completion of the Mittellandkanal, which is to connect Hanover with Magdeburg and to supplement the rail transportation facilities between the east and the west. The construction of new waterways to promote the economic relations with the Baltic provinces has also been advocated as a part of the economic expansion of Germany toward the east.

One of the most prominent bank amalgamations was evidently promptoration. This was the agreement entered into by the Austrian Creditanstalt in Vienna and the Hungarian Allgeneine Credit-Bank in Budapest with the Disconto-Gesellshaft and Norddeutsche bank for closer relations in regard to overseas trade. These agreements will give the Austrian and Hungarian institutions representation on the boards of some of the South American branches of the Disconto-Gesellschaft.

These activities looking to the restoration of German commerce mean the new American merchant marine may expect to meet with severe competition in the ocean-carrying trade. This will be a competition backed by the old enemies of America and for that reason it will be the more severe.

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October Ore Shipments

October, 1918, shipments of ore from upper lake ports are greater by 347,701 tons than those of October, 1917. This serves to increase the lead which this season's shipments have over those of last, which had been lessened by a slump in the movements for August and September. The season's movement to Nov. 1 totals 56,870,871, an increase of 2,617,273 tons over that of 1917. The October, 1918, shipments amount to 8,541,593 tons as compared to 8,193,892 tons for October, 1917. With the end of the season in sight it is evident that all predictions for an ore movement sufficient to meet the demand will be fulfilled.

The following table shows the amount of ore shipped from upper lake ports and the total shipments from each port up to Nov. 1.

	October, 1918	To Nov. 1, 1918
Escanaba	1,015,089	6,052,311
Marquette	437,229	3,250,207
Ashland	1,255,176	6,934,371
Superior	1,887,284	13,064,201
Duluth	2,920,070	19,281,792
Two Harbors	1,026,745	8,287,989
Total	8,541,593	56,870,871
1918 increase	347,701	2,617,273

Lake Erie Receipts

Out of a total of 8,541,593 tons shipped from upper lake ports in October, Lake Erie ports received 6,968,122 tons, as shown by figures compiled by THE MARINE REVIEW. The balance on dock on Nov. 1 was 9,909,279 tons against 8,823,170 tons on Nov. 1, 1917. The detailed receipts by ports follow:

Port	Gross tons
Buffalo and Port Colborne	1,326,563
Erie	323,039
Conneaut	988,762
Ashtabula	1,532,999
Fairport	236,835
Cleveland	1,300,592
Lorain	495,401
Huron	233,267
To'edo	454,190
Detroit	76,474
Total	6,968,122

Soo Canal Report

Of the 13,363,287 net tons of freight which passed through the Soo canal during October, 11,105,254 tons went through the United States canal, while 2,258,033 tons passed through on the Canadian side. Eastbound freight during October amounted to 9,590,305 tons as compared to 3,772,982 tons westbound. The October movement brings the total movement for the season up to 76,164,058 tons or 64,806 tons more than was moved during the same period of time in 1917.

Coal moved westward through the canal during the present season has amounted to 15,909,971 tons as compared to 15,533,631 tons moved in 1917 by Nov. 1. Of this year's tonnage 14,244,240 tons is bituminous coal. The bituminous coal shipped westward through the Soo in 1917 previous to Nov. 1 totaled 888,857 tons less than this figure, or 13,355,383 tons. Iron ore shipments for this year continue to exceed those of last, the comparative figures being 52,907,616 tons for 1917 as against 55,913,671 tons in 1918. Flour shipments also continue to be greater than they were last year. The figures covering the same periods in the two years are 6,275,849 barrels in 1917 as compared with 6,579,894 barrels in 1918. Wheat shipments for 1918 are still far behind those of 1917 although the movement during October amounted to 29,148,980 bushels which more than doubled the season's shipments up to the beginning of that month. Detailed shipments were as follows:

	To Nov. 1, 1917	To Nov. 1, 1918
EASTBOUND		
Lumber, M. ft. B. M.	316,062	263,725
Flour, barrels	6,275,849	6,579,894
Wheat, bushels	129,482,350	47,851,515
Grain, bushels	53,258,698	19,947,472
Copper, net tons	97,795	73,764
Iron ore, net tons	52,907,616	55,913,671
Pig iron, net tons	8,224	.....
Stone, net tons	.....	11,732
General merchandise, net tons	217,102	56,587
Passengers, number	18,711	17,251
WESTBOUND		
Flour, barrels	90	.....
Grain, bushels	5,885	.....
Coal, soft, net tons	13,355,383	14,244,240
Coal, hard, net tons	2,178,248	1,665,731
Iron ore, net tons	58,660	136,036
Manufactured iron and steel, net tons	89,323	35,097
Salt, net tons	74,458	71,507
Oil, net tons	.....	292,729
Stone, net tons	.....	367,875
General merchandise, net tons	1,043,417	339,547
Passengers, number	18,665	17,662
SUMMARY		
Vessel passages, number	19,533	18,237
Registered tonnage, net	55,500,789	54,671,427
Freight—		
Eastbound, net tons	59,300,260	59,011,296
Westbound, net tons	16,798,992	17,152,762
Total freight, net tons	76,099,252	76,164,058

"Iron Ships and Iron Men"

(Concluded from last issue)

The examination in pilot rules is personally administered by the executive officer of the receiving ship, Lieut. John G. Weorpel. The examination covers both the rules for the Great Lakes and those of international water. This examination is the last of the series.

The status of the training for the present year is shown in the figures being extracted from the personal report of the assistant supervisor:

"There are at present 634 men in groups of two and four and in a few cases six, and on five ships a group of 14, stationed on 200 boats. There have been relieved from training up to and including July 15, 521 men, all of whom have completed approximately eight weeks training aboard ship, and all of whom had covered the course of training as laid out for them in the booklet of instruction, and all of whom have been examined as to their knowledge of practical seamanship, nomenclature of ships, laws for the prevention of collision of ships at sea, navy regulations and navy and international signals. The results of these examinations, together with the fitness reports which captains of the ships make out, and which have been found to have been made out conscientiously, are the factors which determine the man's adaptability to the training.

"As a result of the examinations of these 521 men there can be no further vestige of doubt regarding the success of the training."

Too much cannot be said in praise of the patriotic co-operation of the steamship lines to whom a large portion of the credit of the success of the training is due. From the heads of the lines, who made the initial experiment possible and who supported it at all times to the lake captains who gave up large portions of their time to help the reservists master some of the more difficult features of the training, all the steamship companies have given their loyal support.

This, in brief, is what the naval auxiliary reserve has accomplished on the Great Lakes in its first year. Hundreds of young men have been graduated from the school at Pelham and now in the capacity of junior officers are serving aboard American liners and transports. And they are making good. Reports of the enthusiastic and effective manner in which they have taken up their responsible work are constantly flowing into the offices of the navy department.

And they are ambitious fellows too, these young officers. They are not content with an ensign's commission; they are working night and day to add to their knowledge and thus win higher jobs. And for this reason many of them have risen to the rank of junior and grade lieutenants and will undoubtedly advance even higher as time and increased experience prove their capabilities.

America again is building a true merchant marine. Each day, new vessels are sliding down the shipways and groups of American boys, new to the sailors' trade, are leaving training stations to man and officer these ships.

The future of the American merchant marine is more promising because of the enlistment of these boys into the service in which their forefathers were enrolled when American ships sailed every sea. Many of the officers and men of the naval reserve force have heard the call of the sea and will not return to their shore jobs when peace is declared. The infusion into our merchant marine service of this corps of young, well-schooled and enthusiastic Americans will influence tremendously our future on the high seas.

Late Marine Patents

Copies of any one of these patents can be obtained by sending 15 cents in stamps to Siggers and Siggers patent lawyers, National Union building, Washington, D. C., by mentioning THE MARINE REVIEW:

1276741—Boat propelling and steering device; Steven Fazekas, New York.

1276863—Submarine; Attilio Bianchi, New York.

1277028—Submarine; George Watson Beach, Saybrook, Conn.

1277093—Lumbership; Duncan D. McBean, New York.

1277117—Torpedo guard; Odysseus Pilalis, Pittsburgh, Pa.

1277369—Ship protector; Feliks Borucz, Wilkes Barre, Pa.

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American Ship Yard Activities

A Snappy Summary of the Leading Events of the Month in the Vessel Construction Field

What is Happening in San Francisco

By Cruse Carriel

CAPITALISTS who undertake the construction of the two additional drydocks recommended for San Francisco by the port facilities committee of the Emergency Fleet corporation will be assured of priority orders based on war necessity and the encouragement and co-operation of governmental agencies, according to the recent statement of Admiral H. H. Rousseau. At the time the statement was made, Admiral Rousseau was in San Francisco as head of the port facilities committee and incidently to close down the construction of the so-called Liberty shipyard in Alameda, Cal.

His instructions were received by telegraph from the United States shipping board after leaving Philadelphia, and were to terminate the construction work with the greatest expedition and economy. The Liberty yard was to supplement the Alameda yard of the Bethlehem Shipbuilding Corp. and to be operated by it. The stoppage of construction after the expenditure of nearly $2,500,000 created something of a sensation in San Francisco. No reasons for the closing down of the yard were assigned for nearly two weeks. Then it was explained from Washington that the yard was being built by the government for the construction of transports under the superintendence of the Bethlehem company and that, since it had been found that the contracts could not be completed by the end of 1920, work had been ordered stopped. That other elements entered into the decision to stop the construction of the Liberty yard is the general opinion in the San Francisco bay territory. It is said that the shipping board and the Bethlehem Shipbuilding Corp. are finding some difficulty in arranging an equitable and satisfactory distribution of the financial obligations involved in the contracts of the corporation and the labor agitation on the Oakland side of the bay is believed to be another contributing consideration.

Indications of difficulties between the shipbuilding corporation and the shipping board concerning the distribution of financial obligations followed San Francisco's attempt to borrow $450,000 from the Emergency Fleet corporation for building a combination street and steam railway to Hunters point where the Bethlehem Shipbuilding corporation has undertaken the construction of a drydock with repair and fitting-out facilities. Acting under the advice of the head of the transportation and housing division of the Emergency Fleet corporation, Mayor James Rolph of San Francisco went to Philadelphia to arrange for borrowing the $450,000. The sum was to be repaid to the government at the end of two years, less the amount of the depreciation of the railway system in that time. Mayor Rolph reported that the Emergency Fleet corporation and the company had not reached an agreement as to which should advance the money to build the railway. Under these circumstances the building of the railway is held up.

Large Docks Contemplated

The two drydocks which it is desired to have constructed in San Francisco were recommended some time ago by the port facilities committee. Each of them would be able to handle ships up to 10,000 tons. For a while, it was expected that the Emergency Fleet corporation would undertake their building. Under present circumstances there is little hope of this Admiral Rousseau stated. The work will have to be done by private capital without the assistance of government financing, but with the assistance of priority material and labor rights granted by the war industry board and the United States employment bureau.

The construction of the concrete shipyard in Oakland was about 85 per cent complete on Nov. 1 when it was expected the first ship form would be poured soon. The working force in this yard then numbered 1500 which was to be increased to 2500 men. Considerable difficulty was experienced in securing workers for the transbay plants owing to the scarcity of labor, but this was offset in a measure by the release of 2500 men by the Aberthaw Construction Co. when work on the Liberty yard was closed down.

Influenza made serious inroads among the ranks of the San Francisco bay shipworkers. On one day, the Bethlehem Alameda plant reported 900 men off, the Hanlon yards, 600 men, 2 per cent of the concrete shipyard force and 3 per cent of the 2500 employes of the Union Construction Co. were ill. In line with the orders of the local health authorities inhibiting the congregation of large numbers of persons, the Moore Shipbuilding & Drydock Co. postponed a launching until the abatement of the epidemic. The Bethlehem Alameda plant launched the 11,800-ton ARCHER with a brief ceremony, only employes, officials and representatives of the shipping board being present. During the epidemic, no one was permitted to enter or remain in any of the yards in the bay section unless masked. There were several instances of employes taking involuntary vacations because they refused to wear masks.

To provide accommodations for shipworkers, permission to build 500 houses was granted to Oakland, Cal., by the government. San Francisco made a comprehensive survey of her available housing under the superintendence of the housing corporation and with the co-operation of firemen, policemen and mailmen.

The recent order of Edward N. Hurley withholding further contracts from 20 shipyards where wooden vessels are being constructed will not affect the plant of Barnes & Tibbitts plant in the Oakland estuary. This yard is far ahead of its schedule with the government, according to the management. The shipways at the yards are practically completed and machinery is being installed in wooden hulls there as fast as they are towed down from the north. As a matter of fact, the machinists are forced to lay off at times because of the delay in the arrival of hulls.

To Install Machinery in Wooden Ships

Negotiations for the lease of one of the large piers on the waterfront at Galveston, Tex., to the National Shipbuilding Co., Orange, Tex., for use as a plant for outfitting wooden ships with machinery and other equipment, have been concluded. The wharf is double-decked and is completely equipped with electric cranes. It is announced that the work of fitting up the ships will be under the direction of J. C. Grant, Lloyd's surveyor. The outfitting plant will be larger than was originally contemplated. It is stated that it will give employment to approximately 2500 men, most of whom will be skilled mechanics.

The National company's yard at Orange now employs about 2000 men, according to Mr. Grant, and is equipped to turn out two vessels of the Daugherty type each month. These will be towed to Galveston, Tex., and outfitted with machinery as fast as they are launched. The company's contract called for 12 of these vessels, a new contract recently signed being for 16 additional Daugherty-type vessels. These vessels will differ from the first ones in that the engines will be installed amidships instead of aft.

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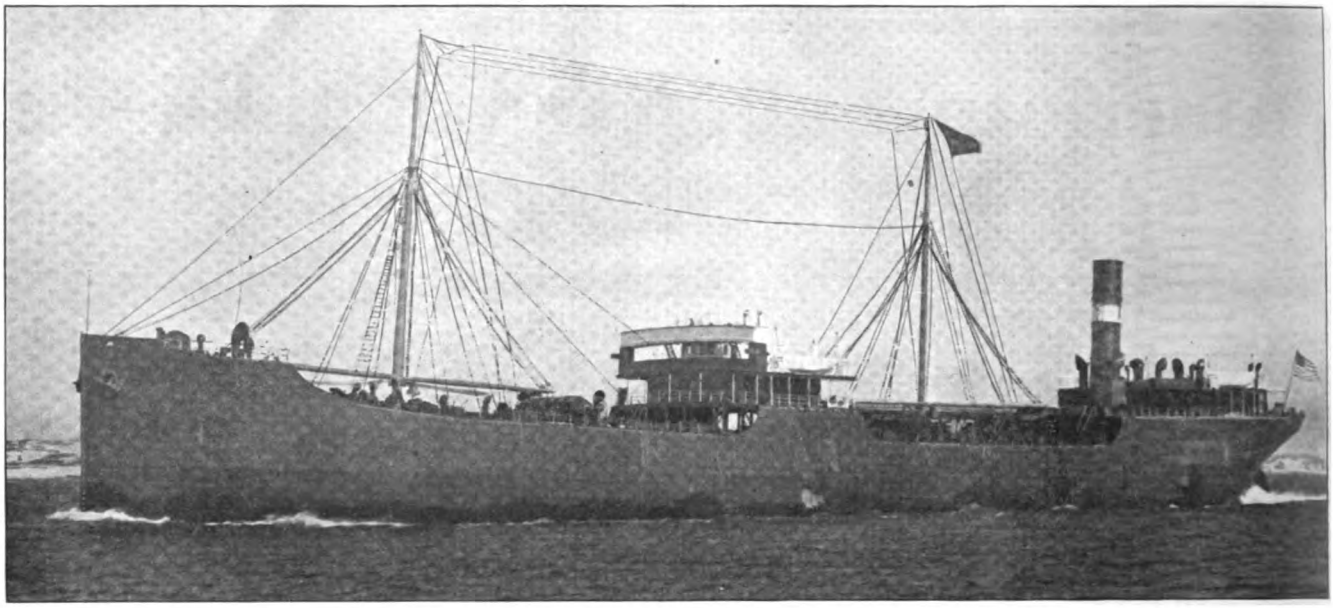


Steel oil tanker, W. L. Steed, built by New England yard and fitted out in less than nine days.

Eastern Yard Sets Fitting-Out Record

THE unprecedented demand for deep-water tonnage has brought about records in building and fitting out ships that are little short of marvelous. The latest yard to come to the front with a speed record is the Fore River plant of the Bethlehem Shipbuilding Corp., Quincy, Mass. This yard recently succeeded in completely fitting out a vessel of 9000 deadweight tons in 8 days, 9 hours and 45 minutes from the time of launching. The vessel is the W. L. STEED, the fourth ship to be delivered to the Emergency Fleet corporation by the Fore River yard since the first of the year and the twenty-sixth vessel to be completed by the corporation's Quincy plant during 1918.

W. H. BENSON

The STEED is a single-screw bulk oil carrier built on the Isherwood system. She is 433 feet long, 56 feet beam and 33 feet deep, and carries 3300 gallons in her tanks when loaded to full capacity.

From the time she was launched until she left the yard for her trial trip, the work progressed with remarkable rapidity.

On Sept. 2 she was launched at 9:45 a. m. and towed over to the wet slip and work progressed continuously on her until she was completed. The first day saw the installation of much material. The starboard, center and port boilers were installed and installation begun on the main and auxiliary steam pipes. The after crossbeam was put in place and stop and safety valves were fitted in position on the boilers. The casing around the boiler room was erected and two sections of the air duct installed next to the screen bulkhead. The escape pipe from the center boiler was fitted and the inspection tank installed. On the second day, Sept. 3, work was done on the steam piping, main and auxiliary feed check valves and water column valves. The furnace fronts were put on all boilers, the starboard, port and center smoke boxes were installed. The center, starboard and port uptakes were placed in position.

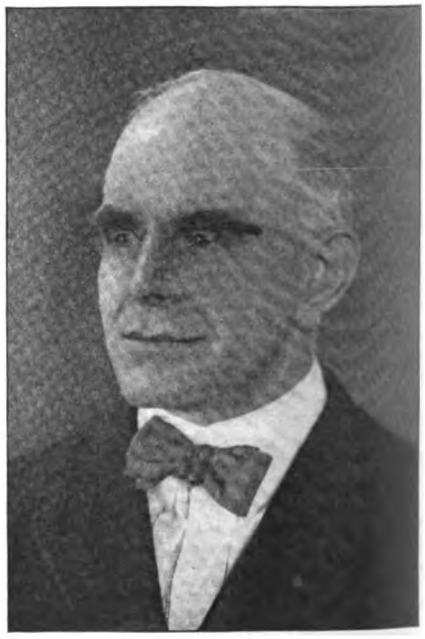
The following work was done on the third day, Sept. 4: Forward crossbeam installed, inner stack foundation placed in position, deck plates fitted and work on the smoke boxes completed. Thus three days saw the work well along.

On the fourth day, Sept. 5, the smokestack was installed, all gratings finished and work was begun on oil piping to the boiler fronts.

The fifth day, Sept. 6, saw the complete installation of the floor plates, air ducts and steam piping. On this day the boilers were also tested by the local inspector.

On the sixth day, Sept. 7, all the piping and the three boilers were lagged. This completed the work of installation.

On the seventh day, Sept. 8, the vessel was given a dock trial at noon, and on the following day she left the yard for her trial trip in just 7 days, 2 hours and 55 minutes from the time she was launched. The trial trip was completed at 7:30 p. m. on the next day, 8 days, 9 hours and 45 minutes from the time she was launched.



H. E. D. GOULD

One reason why the trial trip was not complete until 7:30 p. m. was because it was necessary to take the vessel out into deep water to load her for trial purposes as the water

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in the river leading to the plant is comparatively shallow.

Owing to a mishap at the time of launching, the vessel was not actually delivered within the time stated, the delay being caused by the lack of a drydock for repairs. However, all the work necessary for the delivery of the vessel was complete and the trial run made within the time originally specified.

The STEED, ready for sea, is shown in the large illustration. W. H. Benson, superintendent of hull construction, is shown at the left, and H. E. D. Gould, superintendent of machinery, at the right. It is largely due to the efforts of these men that the STEED was fitted completely in such record-breaking time. The vessel was originally contracted for by the Pan American Petroleum & Transport Co., New York, and was taken over by the shipping board last year. She is a sister ship of the GEORGE W. BARNES, which was delivered this year by the Fore River plant to the shipping board. The Fore River plant has specialized on steel ships for years.

North Pacific Shipyards Make Records

By R. C. Hill

RECENT records of North Pacific shipyards have attracted the attention of builders throughout the country and recently brought from Chairman Edward N. Hurley, of the United States shipping board a congratulatory telegram. Three recent achievements of Washington and Oregon yards have been much out of the ordinary and all were accomplished during the last month, as follows:

Skinner & Eddy Corp., Seattle, launched 8800-ton steel steamer WEST MAHOMET in 46½ working days, thereby reducing the yard's former record by 2½ days.

Grays Harbor Shipbuilding Corp., Aberdeen, Wash., delivered the 4000-ton wooden steamer ABERDEEN in 22½ working days, the vessel having been launched in the record breaking time of 17½ working days.

Seattle-North Pacific Shipbuilding Co., Seattle, launched 9400-ton steel steamer OZETTE in 84 working days; claimed to be a record for a yard's first offering.

While October's launching does not show as great a volume of tonnage as some previous months of the present year, the month witnessed 11 wooden steamers and 7 large steel vessels sent into the water from Oregon and Washington plants. All the yards in that territory are working with efficient organizations and as they are becoming better co-ordinated, the output of tonnage will continue at a high mark. During the winter months, construction will not cease on account of weather conditions for the Pacific northwest can build ships throughout the year without interruption.

During the month, the Foundation yards, Tacoma, Wash., launched the seventeenth auxiliary steam vessel for the French government, the contract having called for 20. The Skinner & Eddy Corp. has contributed three 8800-ton steel carriers, making a total of 35 steel steamers launched from this plant since Sept., 1916, 33 being now in commission, of which 27 are in the service of the United States government. Only 5 more vessels of the 8800-ton type remain to be launched at this plant. Skinner & Eddy have already begun a new contract to build 9600-ton steel steamers for the government. The WEST MAHOMET, the last vessel sent into the water by this plant, is the nineteenth of the original contract for 20 vessels awarded by the government. The completion of this contract was set for July 1, 1919, but so efficiently has this plant functioned that the contract will easily be completed by Jan. 1, 1919. Yard No. 1 is now engaged in building much needed ships of the larger type. The YUKON is the sixth vessel of 7500-ton type launched at the new Tacoma yards of the Todd Dry Dock & Construction Co.

In addition to completing the 4000-ton wooden steamer ABERDEEN in a world record performance, the Grays Harbor Ship Building Corp. launched three vessels of this type within a period of 30 days.

Originally intended as a motorship the schooner BRIGHT, launched by the National Shipbuilding Co., Seattle, will use only sails. Delay in obtaining engines caused the owners to alter their plans. Consequently the BRIGHT will have topmasts installed and will operate entirely under sail. She is the largest sailing vessel launched on Puget sound.

The Emergency Fleet corporation has awarded a contract to the Elliott Bay Shipbuilding Co., Seattle, for five 2500-ton wooden barges. Construction on them has started. This is the first contract of this kind placed in the north Pacific. It is understood they may be used in the coal trade in the Atlantic.

On the British Columbia side, the wooden shipyards have recently taken large contracts to build wood vessels for the French and Italian governments. Private owners are seeking opportunity to place contracts but practically all the yards on the British Columbia side are tied up with work for allied governments. At United States ports, the shipping board has first call on all shipbuilding facilities so that private contracts are difficult to place at the present time. It is thought that as soon as the shipping board stops ordering wooden vessels, there will be a large amount of work awarded by private owners.

Considerable interest attaches to the future of the Foundation yards at Tacoma, Wash., and Portland, Oreg. A year ago, these plants began a contract for 40 wooden auxiliary steamers for the French government. This contract has practically been completed. It is known that officials of the company are soon to make an announcement as to their plans. It is believed that other large contracts are in contemplation although what type of vessel will be built is not yet known. The only announcement obtainable at this time is that the Tacoma and Portland yards will continue in operation upon the completion of the present contracts.

The Washington and Oregon launching record for October follows:

Oct. 1—BOTTINEAU, 3500-ton wooden steamer by Barbare Bros., Tacoma, Wash.

Oct. 1—BOCKONOFF, 3500-ton wooden steamer by Pacific-American Fisheries Co., Bellingham, Wash.

Oct. 24—BRIGHT, 3500-ton wooden schooner by National Shipbuilding Co., Seattle.

Oct. 5—WEST MADAKET, 8800-ton steel steamer by Skinner & Eddy Corp., Seattle.

Oct. 14—WEST ELDARA, 8800-ton steel steamer by Skinner & Eddy Corp.

Oct. 19—WEST MAHOMET, 8800-ton steel steamer by Skinner & Eddy Corp.

Oct. 8—EGALITE, 3000-ton wooden steamer by Foundation Co., Tacoma, Wash.

Oct. 17—VAILLY, 3000-ton wooden steamer by Foundation Co., Tacoma, Wash.

Oct. 1—ADWAY, 3500-ton wooden steamer by Nilsen & Kelez, Seattle.

Oct. 18—CADDAPECK, 3800-ton steel steamer by Albina Engine & Machine Works, Portland, Oreg.

Oct. 19—FORT SEWARD, 3500-ton wooden steamer by Grant Smith-Porter Co., Portland, Oreg.

Oct. 9—AIMWELL, 3500-ton wooden steamer by G. M. Standifer Construction Corp., Vancouver, Wash.

Oct. 18—BROOKHAVEN, 4000-ton wooden steamer by Grays Harbor Shipbuilding Corp., Aberdeen, Wash.

Oct. 25—BROOKLAND, 4000-ton wooden steamer by Grays Harbor Shipbuilding Corp., Aberdeen, Wash.

Oct. 5—ADDISON, 3500-ton wooden steamer by Sanderson & Porter Shipbuilding Co., Raymond, Wash.

Oct. 26—YUKON, 7500-ton steel steamer by Todd Drydock & Construction Co., Tacoma, Wash.

Oct. 26—WEST COBALT, 8800-ton steel steamer by Columbia River Shipbuilding Corp., Portland, Oreg.

Oct. 26—WEST ZEDA, 8800-ton steel steamer by Northwest Steel Co., Portland, Oreg.

The Port Arthur Shipbuilding Co., Ltd., Port Arthur, Ont., recently launched the steel freighter WAR HORUS. This vessel is a steel screw, single deck, general freight carrying ship with a straight stem and semi-elliptical stern with poop, bridge and forecastle. She is built on the traverse system with inner bottoms throughout. Her general dimensions are as follows:

Length overall, feet	261
Length between perpindiculars, feet	251
Molded depth, feet	23
Molded breath, feet	43½
Tonnage, gross	2240
Tonnage, deadweight	3400

Cargo will be handled by means of four steel derrick masts fitted with eight booms. Each boom is served by a 7 x 12 inch reversing type double-drum steam winch.

The vessels propulsion machinery consists of a triple-expansion surface-condensing engine with cylinders 20½, 34½ and 55 inches bore x 40 inch stroke. Steam is generated by two scotch boilers 15 feet in diameter and 11 feet long. The working pressure is 190 pounds per square inch and the engine develops 1500 indicated horsepower. The vessel was built to the order of the Imperial Munitions Board.

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New Way to Build Concrete Boats

Cleveland Company Tries Out Novel Method of Launching—First Boats of Cement Built on the Great Lakes

WATERCRAFT of reinforced concrete are now being built on the Great Lakes. The distinction of being the first to build boats of this material on the lakes goes to the Liberty Shipbuilding & Transportation Co., which is just completing its yard at Cleveland. This company originally designed to build power workboats with the use of cement, was awarded a contract last July for six barges by the quartermaster's department of the United States army. The first boat launched will be one of these barges, intended for use as car-floats in American harbors.

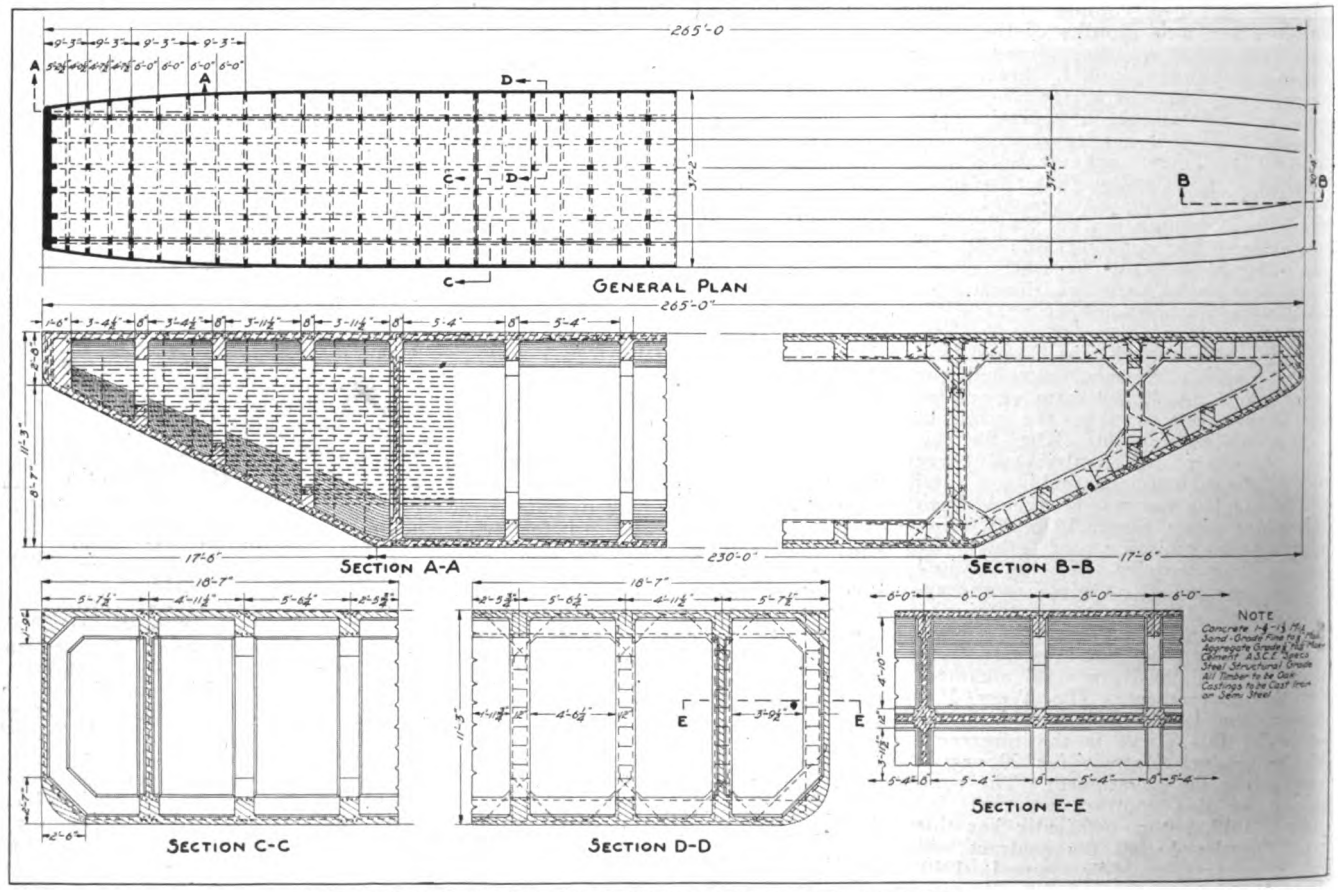
BUILDING WAYS AT NEW CONCRETE SHIP PLANT

The Liberty plant was projected early in 1918, but work on the yard was not started until the first part of May. It was but a short time after this that the contract for harbor floats for the army was awarded. The yard has two ways and a slip which is to be equipped with a fitting-out dock when the company begins to build workboats later on for private account.

The barges are 265 feet long, 37 feet 2 inches beam, and 11 feet 3 inches deep. They have a draft of 5 feet 3 inches when light. These barges are designed to carry 16 freight cars as a maximum load. Their draft will be 9 feet 3 inches when loaded. They have two longitudinal and four transverse bulkheads. The bottom and decks of the barges are 4½ inches thick. The sides and bulkheads are 3½ inches thick.

An interesting fact about the construction of concrete craft in the yards of the Liberty Shipbuilding company is the manner of launching. All of the boats will be launched stern on into the water.

One of the most serious problems



PLAN AND SECTIONAL VIEWS OF CONCRETE BARGES BUILT ON THE LAKES

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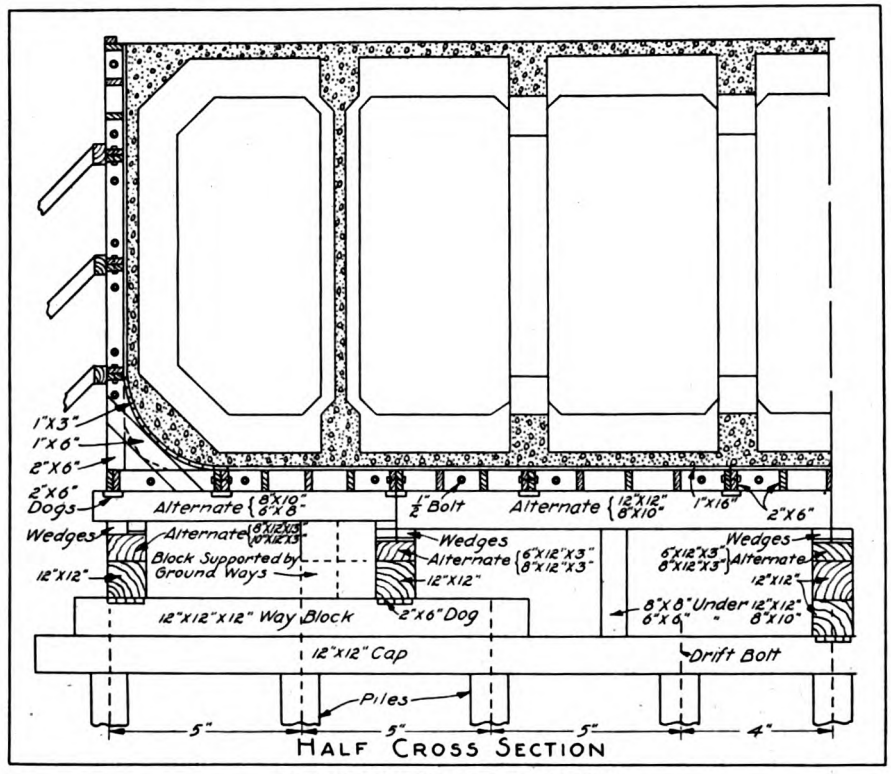
with which builders of concrete ships have to contend is the removal of the outer mold in which the vessel is poured. In the early days of the concrete ship industry it was common practice to build the vessel upside down, in which case the mold was readily removed. Launching vessels in this position, however, is not always practicable. Another method is to launch the vessel with the outer mold still in place. In this case the mold is removed and recovered after launching. The engineers of the Liberty company have developed a plan that offers great possibilities. The vessels are built in an upright position and launched endwise. The outer forms are made in three sections which comprise two sides running to a point just under the curve of the bilges and three bottom sections. Each of these sections, in turn, is composed of units approximately 6 feet square. After the vessel is poured and dried, side forms are moved back 4 feet and left standing. The part of the bottom forms directly above the launching ways are also removed and a launching cradle built up from the ways. The remainder of the bottom forms are then removed. The entire hull can be inspected as the float is standing on the ways ready for launching.

By this plan the sections that compose the molds can be used over and over again, with minor repairs, thus effecting a large saving in the material used in their construction. The plans at first call for the use of these molds three times. Even though used but three times there will be considerable saving of labor and material. This is of considerable importance as shipbuilders in this country who have been working in cement find that the building of the molds and their cost are important items. The Liberty company estimates that it takes two months to build such a barge, although with more experience it is probable that this time will be further limited. Plans call for carfloats, barges and similar small craft being turned out rapidly. The preliminary estimates based upon the experience gained in constructing the first of these floats for the American army, led the promoters to figure that these concrete floats will cost approximately 25 per cent less than a wooden float of the same capacity.

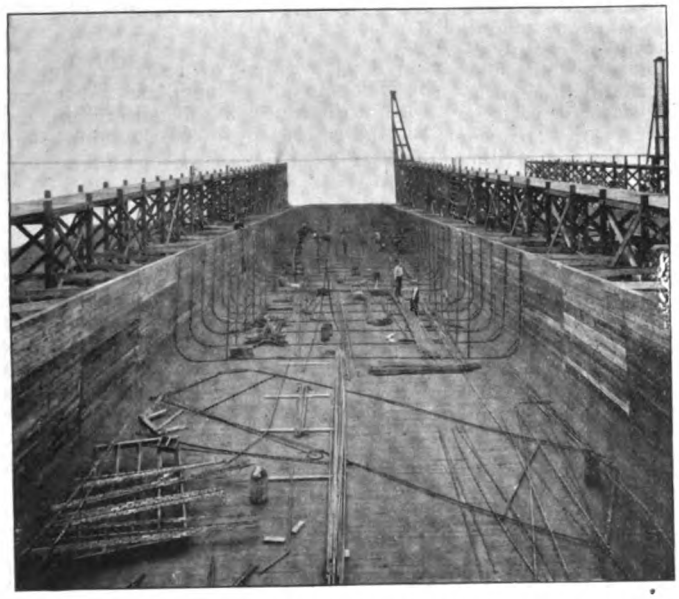
The efficiency of this type of craft has been proved. The use of small reinforced concrete boats in European waters has already shown this. It is said that the Italian military forces have made use of such craft. Similar floats built of cement were used by the Italians in their offensive around Venice. They were mounted with big guns and moved up against the Austrians. The Liberty Shipbuilding & Transportation Co. has been capitalized at



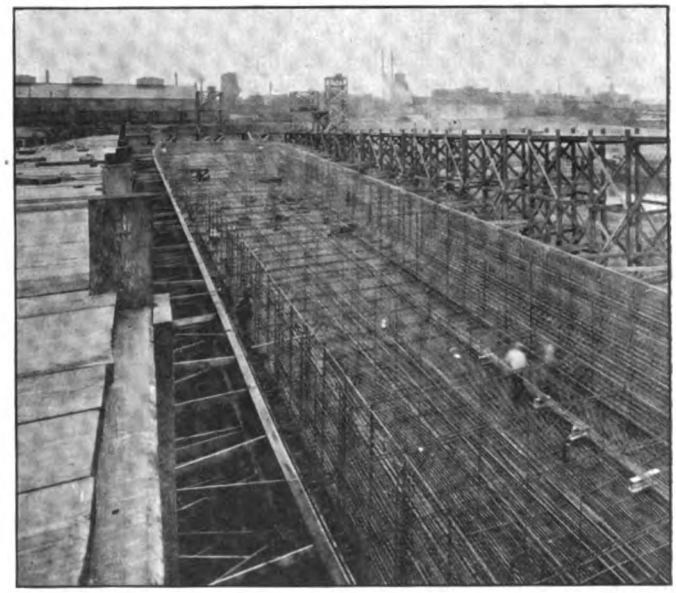
VIEW SHOWING METHOD OF LAUNCHING

The Men Behind

The story of the Liberty Shipbuilding plant would be incomplete without mention of the men who are in active charge of the work. All of the negotiations with the government officials have been carried on by W. T. Duggan, sales manager of the Cleveland Builders' Supply Co., who is contract manager of the new company. The designing was in charge of Frank L. Gorman, while the actual construction is supervised by H. J. Sprackling, general superintendent, ably assisted by C. D. C. Wilson, assistant superintendent. All of these men are associated with the Watson Engineering Co. of Cleveland.



BUILDING THE WOODEN MOLD DIRECTLY ON THE LAUNCHING WAYS



PLACING THE STEEL REINFORCEMENT PRIOR TO POURING THE CONCRETE

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$250,000 with John A. Kling, president of the Kelly Island Lime & Transport Co., Cleveland, president; Kern Gill, of the John Gill Sons Co., Cleveland, is vice president. W. J. Rossiter, president of the Cleveland Builders Supply Co., is secretary. John Mahoney, of the Great Lakes Dredge & Dock Co., is general manager, and Wilber J. Watson, of the Watson Engineering Co., is the chief engineer. All of these are men of practical experience in the handling of construction problems.

In the construction of these barges approximately 178½ gross tons of steel and about 700 cubic yards of concrete are being used, the total contract for the six barges therefore requiring over 1000 tons of steel and 4200 cubic yards of concrete. A completed barge, it is estimated, will weigh approximately 1340 gross tons after the concrete has been poured. The steel will constitute about two-fifteenths of the total structure, but this is exclusive of the fittings.

The ribs, stanchions, stringers and skeleton are 1-inch steel bars. These are the most substantial of the reinforcements. The main bars are ⅝-inch in diameter while the transverse bars in the shell are but ½-inch diameter.

Latest News from American Shipyards

THE new Eagle submarine chasers under construction at the Ford plant, Detroit, are a complete success, according to a recent official announcement made by Lieut. Commander Ogden T. McClurg, chief of staff of the ninth, tenth and eleventh naval districts. EAGLE No. 1 has been launched and will be in commission soon. Several others have been launched, but the official tests were made on the first vessel.

* * *

Augusta, Me., is to have a new shipyard, the Rockport Shipbuilding Co., which was recently organized with a capital of $40,000. E. M. Leavitt is president and treasurer and the directors are: E. M. Leavitt, Ernest McLean and D. L. Fogg. It is the intention of the company to carry on a general shipbuilding business.

* * *

A Portland, Oreg., yard recently launched a vessel 98 per cent complete the CADDOPECK, a 3800-ton vessel.

* * *

The Tampa Dock Co., Tampa, Fla., recently launched the wooden steamer COULTER, a vessel of 3500 tons. She is a Ferris-type vessel and the third to be launched by the company. She took the water 98 per cent complete.

* * *

A riveting gang employed in the Union plant of the Bethlehem Shipbuilding Corp., San Francisco, recently drove 12,579 half-inch rivets in eight hours. This is claimed by the yard to be a world's record. The riveting was done under the supervision of a naval inspector. In the first hour, 1504 rivets were driven. According to the record as compiled the number of rivets driven in each of the seven remaining hours were: 1877, 1555, 1408, 1621, 1588, 1526 and 1490.

* * *

The second seagoing tug on a contract for seven was recently launched by the Savannah Engineering & Construction Co., Savannah, Ga. The vessels are building for the United States shipping board. The vessel was christened the LABORER. She is built to standard design and is constructed of wood, 150 feet overall, and is valued at $200,000. Construction work on the five remaining craft is being expedited as rapidly as possible.

* * *

The plant and equipment of the Hess Iron Works, Inc., Sturgeon Bay, Wis., has been taken over by the Universal Shipbuilding Co. of the same city. The transaction will enable the Universal company to accept contracts for steel vessels. At present, this company is building tugs. W. J. Hess, general manager of the Hess Iron Works, will act as superintendent of fabrication and boiler construction for the Universal company.

* * *

Ths new 8800-ton steamship WESTPORT, recently built by the Ames Shipbuilding & Dry Dock Co., Seattle, averaged 14 knots an hour on her trial trip. The vessel is a Seattle product throughout, as her hull, engines, boilers and other equipment were all made by the Ames company. Following the vessel's trial trip and speed tests, she was turned over to officers of the shipping board, who delivered her to the navy for service as an auxiliary vessel.

* * *

The northwest will contribute 45 wooden steamers in 1918 to the Emergency Fleet corporation. In addition, yards in the Columbia river district will have launched 105 more which will not be equipped until Jan. 1, 1919. This means a total contribution by this section of the Pacific coast of 540,000 tons to the government's merchant fleet.

* * *

The largest hotel in the world, it is claimed, is being operated at Philadelphia. It was built under the direction of the government for the use of single men employed at the Hog Island shipyard. It is known as the Emergency Fleet hotel. It covers 18 acres and is within a mile of the shipyard gates, directly across the street from the new park of the Hog Island Athletic association. It is connected with the yard by a steam railroad line with frequent train service in the morning and evening rush hours. The hotel contains 2175 single sleeping rooms which is said to be the world's record in this regard.

* * *

Continuance of the wooden shipbuilding program is indicated in the shipping board's estimates of $454,000,000 for new ships and shipbuilding facilities. The total asked for new ships includes $210,000,000 for steel and $244,000,000 for wooden ships. Concrete vessels are not included in this estimate. These estimates were submitted to the house appropriations committee by Chairman Hurley and General Manager Piez of the shipping board. For increasing shipyard facilities, $34,000,000 is asked.

* * *

The Clarke-Martin Shipbuilding Corp., Catskill, N. Y., and New York city, has been formed with $100,000 capital. The corporation will build concrete boats for the government and also for private firms. F. Toomey is president of the firm and George W. Clarke is treasurer. The yards will be located in Catskill and the offices in New York.

* * *

A new west coast record in framing a wooden vessel for the Emergency Fleet corporation is claimed by the Grant-Smith-Porter Co., Aberdeen, Wash. In 66 hours a crew of 43 men put 75 frames in place.

* * *

M. M. Davis & Son, Inc., Solomons, Md., launched recently the first wooden hull in the old third district of the Emergency Fleet corporation which comprises Delaware, Maryland and Virginia. It is one of 20 complete seagoing tugs under contract with the shipping board for construction in the Davis yard.

* * *

Construction of the first of five 2500-ton wooden barges ordered by the Emergency Fleet corporation was recently begun by the Elliott Bay Shipbuilding Co., Seattle. This concern received the first contract for craft of this type placed by the government on the Pacific coast. It was at first reported that these were to be sailing ships but the shipping board has announced that the vessels will be used as barges in the Atlantic coal trade.

* * *

With the object of reducing shipyard accidents to a minimum, the Emergency Fleet corporation has begun a campaign for the education of 400,000 shipworkers of the yards engaged on government work.

* * *

The Ames Shipbuilding & Dry Dock Co., Seattle, recently launched the WEST CAPE, an 8800-ton carrier. The vessel was originally designed for the company's own account, but was included in the commandeering order issued in August, last year. She will be powered with 3000 horsepower engines of the reciprocating type and will have water-tube boilers. Her full equipment is to be made by the Ames company.

* * *

The Kelley-Spear yard at Bath, Me., has been purchased by Boston capitalists, according to report, and will be incorporated under the laws of Maine as the Kelley-Spear Co., Inc.

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Book Reviews

The Shipbuilders' Blue Book, by Walter Kay Crawford; cloth; 80 pages, 3½ x 6 inches; published by the Ocean Publishing Co., and furnished by THE MARINE REVIEW for $1.50.

The author is a practical shipbuilder of 30 years' experience whose knowledge has been gained on new and repair work both in this and European countries. The book contains concise information on the following subjects: Seam or edge riveting, buttlaps, buttstraps, seam riveting for oil-tight work, beam brackets, rivets and rivet spacing, length of rivets, connections of floors to margin plates, number of rivets between frames in outside plating, spacing of rivets, scarfs in bar keels and stems, edge distance on plates, distance from heel of angles to center of rivet holes, width of attachment angles, distance between stairway treads; breadth of buttlaps, buttstraps and edge laps with size of rivet; weight of smokestacks, weight of round and square iron, weight of material, weight of wood, weight of steel and iron plates, weight of chain, steel boat davits, wood deck fastening, abbreviated marks on plates and Lloyd's rules for bulkheads.

An appendix has been added which contains information on the following subjects: Diameters and circumferences of circles, shearing strength of rivets in tons, lineal measure, square measure, cubic measure, metric system and a table of decimal equivalents of fractional parts of one inch. The appendix also contains a glossary of shipbuilding terms arranged in alphabetical order which should prove of value to the newcomer in the shipyard.

The book is written from a practical point of view and contains many illustrations. The descriptions given are short and to the point and a large amount of information has been condensed into a small space.

Ports and Terminal Facilities, by Roy S. MacElwee; cloth; 315 pages, 6 x 9 inches; published by McGraw-Hill Book Co., and furnished by THE MARINE REVIEW for $3.00.

Now that the United States is again taking her proper rank as a leading factor in world commerce, the subjects of ports and facilities for handling an immense volume of imports and exports is one of vital interest. What makes a successful port? This is a pertinent question asked in the introduction of the book under discussion. The author in this work points out some of the factors that enter into the problem. His qualifications to discuss the subject are excellent as his interests in ports has extended through a score of years of travel and business abroad and some six years ago he took up the intensive study of the question while in charge of the Hamburg office of an American firm that built elevators and hoisting machinery.

The book is carefully written and contains many illustrations. The author takes pains to point out how port problems are solved in large foreign shipping centers and draws many interesting comparisons.

The book is divided into 18 chapters as follows: The nature of the problem; the relative importance and physical characteristics of the world's leading ports; general characteristics of a well-co-ordinated seaport; port competition for rail and maritime freight; the harbor belt railway and competition at the terminals; lighterage; cartage, drays and motor trucks; piers, wharves and quays; wharf equipment; cargo transfer and handling; shed quipment; the warehouse; standard package or specialized freight; bulk freight; inland waterways and the seaport; the industrial harbor and upland development; the free port as an institution; the process by which the free ports of Hamburg and Bremen were created. A bibliography gives a large list of other books pertaining to the subjects of ports and shipping.

Modern Seamanship, by Austin M. Knight; cloth; 712 pages, 4½ x 7½ inches; published by D. Van Nostrand Co. and furnished by THE MARINE REVIEW for $3.00.

The author is a high ranking rear admiral in the United States navy, formerly head of the United States Naval War college, Newport, R. I., and later in command of the Pacific squadron. The book in question has had a wide circulation, has run through six editions and this, the seventh, has been revised and brought thoroughly up to date.

The present edition has been made as complete as possible by the introduction of a large amount of new material of current interest. Obsolete data have been eliminated and the material from older editions that is used has been thoroughly revised and rewritten. While the changes have added to the contents of the book, its size has been materially reduced by decreasing the weight of paper used, both for text and illustrations. In its present form, the book is much easier to handle than in previous editions.

The book starts with a graphic description of the hull and fittings of a battleship in which numerous illustrations are used to make the text as clear as possible. Several pages are devoted to rope knotting and splicing, which include directions for working in hemp rope, both tarred and untarred, manila and wire rope.

The chapter on small boats is quite complete. Boats designed to be carried on shipboard are subject to many requirements connected with lowering, hoisting and stowing which define their characteristics within narrow limits, especially as regards their size and weight, so that the author has treated the subject thoroughly. The most desirable types of boats to use are described and full directions are given for their care.

The subject of ground tackle is fully described and made clear by many illustrations, and directions are given for carrying out anchors under all conditions. Other information is included. The weather, law of storms, and handling vessels in heavy weather are treated at length as it is felt that a thorough knowledge of the subjects should be acquired by every person who follows the sea.

A chapter is devoted to the handling of torpedo vessels. This is a subject upon which little has been written. As the author's work is wholly from practical experience, this part of the book is especially interesting.

Other timely subjects treated fully are towing, rescuing the crew of a wrecked vessel, stranding, and hints for junior officers doing line duty.

A concise description of sailing vessels has been incorporated in the appendix, which also contains considerable information on such topics as tonnage of ships, ship's pumps and their uses, permitted draft of ships, rope for the United States navy, and buoyage.

The book is well illustrated and the subject matter is written in a clear style which permits of no misunderstanding. The topics are so arranged that any subject can be found readily.

Barge Canal Handles Large Shipments

The New York state barge canal is handling heavy shipments of grain from the Great Lakes to the Atlantic coast. Some complaints have been made that the channel is not deep enough in some places to permit deep-draft barges to pass without grounding. Replying to the question as to when the canal would be completed to the full required depth of 12 feet for its entire length, State Engineer Frank M. Williams recently stated:

"The barge canal work is progressing favorably and the channel construction should be entirely completed by next spring. All of the terminals, however, will not be fully equipped and in operation by that time, although most of them may be in usable shape. As soon as sections of the canal are finished by the state engineer, they are turned over to the superintendent of public works for operation and maintenance. It will be necessary for that department to remove such slides as may occur and also to dredge such silt as may be deposited. Not many sections of the canal, however, are subject to slides and these will be greatly reduced in extent as time passes and the canal banks are found to have taken their natural angle of repose.

"Inasmuch as a large portion of the canal lies in the beds of natural streams, bars are bound to occasionally form at the entrances of tributary streams, particularly at times of exceptional flood. These, of course, must be removed under the head of maintenance."

Traffic along the Erie canal is increasing rapidly, and state officials say that everything points to a big windup during the remainder of the season. Many of the new boats are arriving in Buffalo almost daily, loaded with flaxseed, oilmeal and other material from New York. When it is impossible to obtain loads at New

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York for the boats they proceed to Buffalo, light, and, loading with grain, return immediately to the seaboard. Occasionally these boats take on a cargo of copper and flour. Two of the government's new barges reached Buffalo recently with cargoes of flax, while a third went to Niagara Falls with its cargo of the same material. These boats have a carrying cargo capacity of 500 tons each.

Grain as it arrives in Buffalo is immediately transferred to the canal barges by floating elevators.

Princess Sophia Lost

ALASKAN waters have again taken a heavy toll of human life and the worst marine disaster of the Pacific coast has passed into history. When the fine Canadian Pacific steamship PRINCESS SOPHIA went down off Vanderbilt reef, Lynn canal, half way between Juneau and Skagway, Alaska, 268 passengers and 75 members of the crew, or a total of 343, lost their lives in the cold, stormy waters. Not a life was saved.

The PRINCESS SOPHIA was of the finest vessels operating to Alaska. She was built at Paisley, Scotland, in 1912, and for six years had been a popular vessel with Alaskans. Her accommodations were filled with hardy prospectors, miners, traders and merchants from interior Alaska when she sailed from Skagway on the night of Oct. 23. The next morning in a blinding snowstorm she went aground on Vanderbilt reef. There seemed no danger as the vessel hung hard and fast and the master expected to float the vessel without assistance. He deemed it safer to keep his passengers aboard than to attempt to land them in small boats. For 48 hours the steel hull clung to the reef until the terrific winds wrenched her loose from the rocks and she sank in deep water with all on board. The weather was too rough to permit rescue vessels to take off passengers and crew.

There have been many casualties in Alaskan waters, notably the wreck of the steamers ISLANDER and DISCOVERY close by, in 1902, but none has ever taken such a toll of widely known Alaskans as that of the PRINCESS SOPHIA. Men and women identified with the northern territory, Kondike and other sections of Alaska, were among those lost.

Vanderbilt reef has always been a danger spot for mariners bound to and from Skagway, Alaska. Five years ago, Washington was requested to place an aid to navigation on this reef but it was never done. The PRINCESS SOPHIA went ashore in a blinding snowstorm and no blame attaches to the captain who perished with the others.

The following are some of the more serious marine disasters on the north Pacific with loss of life:

Jan. 9, 1904—Steamer CLALLAM foundered in Straits of Juan de Fuca; 54 lost.

Jan. 25, 1906—Steamer VALENCIA lost off Cape Beale, Vancouver island; 115 lost.

November, 1906—Steamer DIX sunk in collision with steamer JEANIE in Seattle harbor; 33 lost.

July 21, 1907—Steamer COLUMBIA sunk in collision off Oregon coast; 38 lost.

Sept. 20, 1908—Bark STAR OF BENGAL lost on Coronation island, Alaska; 110 lost.

Jan. 12, 1910—Steamer CZARINA lost off Coos bay, Oregon; 15 lost.

Jan. 9, 1913—Tank steamer ROSECRANS foundered off Columbia river; 33 lost.

April 6, 1913—German bark MIMI wrecked off Oregon coast; 18 lost.

Aug. 18, 1913—Steamer STATE OF CALIFORNIA wrecked in Gambier bay, Alaska; 40 lost.

Sept. 18, 1914—Steamer FRANCIS H. LEGGETT foundered off Oregon coast; 62 lost.

Aug. 26, 1914—Steamer ADMIRAL SAMPSON sunk in collision with steamer PRINCESS VICTORIA in Puget sound; 11 lost.

Nov. 2, 1915—Steamer SANTA CLARA wrecked off Coos bay, Oregon; 12 lost.

Nov. 23, 1915—Steamer HANALEI wrecked on Duxbury reef, California; 23 lost.

Nov. 26, 1915—Chilean ship CARELMAPU wrecked on Vancouver island; 18 lost.

May 10, 1916—Steamer ROANOKE foundered off California coast; 47 lost.

Oct. 26, 1918—Steamer PRINCESS SOPHIA lost off Vanderbilt reef, Lynn canal, Alaska; 343 lost.

Should Study Steel Mill Methods

A Letter to the Editor of The Marine Review

THE degree of the success of the fabricated steel ship is dependent upon the constructor's application of market conditions and trade customs. It is a management problem.

The shipyard constructing this type of vessel becomes an assembler of components under the inspection of Lloyds, the American Bureau of Shipping and the owners. Steel is the item of greatest importance, so the management must be familiar with steel mill customs and routine and the common practice of structural shops generally. A few illustrations will clarify this.

A yard working on this type of vessel ordered each plate, each shape and bar to definite dimensions and each item was to bear a definite individual mark. Sixty-four floor plates, all of exactly the same dimensions for each ship were ordered as 32 items, marked with 32 distinct marks instead of 64 plates each bearing the same mark. And so it went with floor chords, frames, deck beams, pillars and fillers. The material section never realized what this meant to the mill and particularly at this time—it was shipyard practice anyway.

To make the work more interesting all furnaced work was to be done at the yard and all straight work at the fabricator and "Oh, Boy", what a glorious time when the fabricator wanted an angle 2 feet 6 inches long marked SO-5 and all they could find was one 2 feet 6 inches long, marked PD-9. And those 32 floor plates; floor at frame 99 could not be fabricated because the mark could not be read. This doesn't sound reasonable but the drawing room was assigning material on shop bills by material schedule sheet item number and any deviation would "ball" up the "system".

It is all right now but this yard will buy 64 plates so x so, marked PP-5 and their angles will come random lengths the next time.

The point here is that structural shop practice is already pretty well harmonized with steel mill practice; shipyard practice is a weak sister. The management should have had his naval architect spend a few days with the structural shop or better yet have turned over all of the ordering detail to a competent steel material clerk.

Another instance.—Three months were wasted getting out a stern frame. The original design called for a steel forging—the naval architect liked a forging, in conference. Market conditions were not considered. Later some tall hustling got delivery of a cast steel frame just in time to avoid more than a two weeks' delay.

Naval architect's moral: Ask the purchasing agent the status of the market on forgings or steel castings, or wire rope or chain. He'll be glad to tell you and his advice will bolster your reputation.

The railroad conditions weren't given much thought and the good dollars that were spent on "special movement" and car tracer's "expense accounts" would have paid the general manager's salary for a year and kept his car in gas and oil besides. Why not get a live wire clerk from the car tracing department of a railroad; he'd be a handy man to have around. Use him to follow up orders already placed with manufacturers as well as trace cars and let the shipper route the shipments, as 80 per cent of the manufacturers with which the shipyards of today are doing business have expert traffic departments.

This condition was true all down the line; requisitions for machinery and equipment were all based and timed on "shipyard practice" with "responsibility" fully fixed but production schedules shot to pieces, results a long way off and a big black mark for the fabricated ship.

This is the condition in one yard, there are many others, whose conditions vary in degree only and they aren't going to be very profitable—they aren't building ships as rapidly as we need them nor as speedily as they can.

Tell the ones you know to get busy and make the acquaintance of methods, policies and trade customs of the manufacturers who are supplying them components; follow general market and traffic conditions; get the material into the yard and let the yard and inspectors build the ships.

(Signed) "FABRICATOR."

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On the Coasts, Lakes and Rivers

What's Doing and Who's Doing It

Collision Sends Freighter to Bottom

By M. L. Shaner

THE steamer W. R. LINN of the Pittsburgh Steamship Co. was sunk in collision with the steamer AMERICA on the morning of Monday, Nov. 4. The LINN went to the bottom in 36 feet of water about a mile above the Port Huron, Mich., lightship, a little to the eastward of the channel. In the hour and a half between the time the steamer was struck and the time she sank the crew had plenty of time to get aboard the barge MAIDA which the LINN had in tow. Both the LINN and AMERICA were downbound and, the weather being thick, the LINN and MAIDA were at anchor when the accident took place. The AMERICA hit the LINN a little forward of the engine room, tearing a hole in her side. The wreck has been marked by a gas buoy 150 feet off her bow and large anchor lights have been placed forward and aft. A small light has been placed on the wreck. She lies three miles north a quarter east from the Corsica shoal light. Wreckers have started to work on the steamer and are confident that with good weather they will be able to raise her this fall. It may not even be necessary to lighter any of her 6000-ton ore cargo. The AMERICA, which was quite badly damaged forward, went on to Port Huron. Her bow was pretty badly stove in but the damage was all above the water line. She is owned by the Great Lakes Transportation Co., Midland, Ont.

* * *

Roger Sullivan of Chicago has been elected president of the Great Lakes Dredge & Dock Co., Chicago, to succeed the late W. A. Lydon.

* * *

The bulk freighter C. R. VAN HISE, which was recently reconstructed for deep sea service by the Buffalo Construction & Contracting Co. and the Lake Shipbuilding Co., has been cut in two and will start on her journey to Montreal. Owing to the width of the VAN HISE it will be necessary to turn her over on her side to get her through the canals. It is reported that she will have to be rolled and righted eight times between Buffalo and Montreal.

* * *

Henry Penton, district manager of the Emergency Fleet corporation, announces that the Great Lakes district in October delivered 52½ per cent of all the steel ships built in the United States. This is the fourth consecutive month in which the lakes district has delivered 50 per cent or more of the total steel ship production of the country. The average of all deliveries was 87 days ahead of contract time. One ship was nearly a year ahead of schedule and others six and seven months.

* * *

Navigation closed for the Great Lakes Transit Corp. on Nov. 9. No freight was accepted for forwarding to the northwest via lake after 8 a. m. of that date.

* * *

Capt. John F. Hansen has been appointed United States local inspector of hulls at Chicago, filling the vacancy created by the retirement of Capt. Gustave Atkinson. At the time of the new appointment Captain Hansen was assistant hull inspector at Duluth and previous to that was, for a number of years, assistant hull inspector at Detroit. Before entering the steamboat inspection service, Captain Hansen sailed boats operated by Thomas Cranage of Bay City, Mich.

* * *

The barge CHICKAMAUGA of the Richardson fleet has been placed in winter quarters at Milwaukee after unloading a cargo of coal there.

* * *

Special supervision of lake shipping conditions, designed to guard against accidents in fall storms, went into effect Nov. 1. Two assistant inspectors have been assigned to duty in Sault Ste. Marie, Mich., two at the Canadian Soo and two in Duluth and Superior. These men, in addition to exercising a cautionary influence against overloading of ships, will correct, so far as they can, any other conditions which might expose freighters or their crews to extra hazard during uncertain weather of the late navigation season. The supervision is similar to that exercised in the fall months of 1916 and 1917.

* * *

November saw many steel barges laid up for the winter at various ports. After the first week in the month the barges of the Pittsburgh Steamship Co. were dropped as fast as they arrived at Lake Erie ports. The barge CARRINGTON went into winter quarters at Toledo.

* * *

The steamer CHARLES HUBBARD lost part of her shoe Saturday, Oct. 26, off Knife river. She was towed to Duluth by the tugs MISSOURI and WISCONSIN and from there the steamer DENMARK took her on to Cleveland. When she was placed in drydock it was found that her shoe and rudder were twisted and that she had 11 damaged plates.

* * *

The barge JOHN GASKIN sank in the Soulanges canal the latter part of October completely blocking navigation. The boat was in bad shape and was abandoned to the underwriters as a total constructive loss. She was removed from the channel immediately to make it possible for boats to pass through. The Soulanges canal had been put out of business once before during the month when a break in the canal tied up navigation for more than a week.

* * *

The steamer MAGNOLIA of the Canada Steamship lines was damaged by fire at Toronto, Thursday, Oct. 31. It is estimated that repairs will cost about $12,000.

* * *

At a meeting of the directors of the Great Lakes Towing Co., Nov. 4, Henry E. Gilpin, Cleveland, was elected president of the company to succeed the late Samual P. Shane. Mr. Gilpin was with the Erie Railroad Co. for 25 years as superintendent and general agent.

* * *

Capt. John E. Place died at his home in Detroit, Thursday, Oct. 24. He had been in the service of the Gilchrist Transportation Co. as master of the steamers S. C. HALL, VIKING and other vessels for 22 years. Captain Place was 49 years old and had retired from the lakes four years ago.

* * *

The steamer VULCAN went ashore at Point Abbaye, Keeweenaw Point, Lake Superior, Oct. 31. She was towed into Portage river harbor of refuge by the tug ALABAMA and the lighter RELIANCE. A large part of her cargo of coal was lightered and delivered to the consignee at Houghton, Mich. The VULCAN'S pilot house was off and her steering gear broken. She is the property of the Atlas Steamship Co. of Duluth.

* * *

The sufferers from recent Minnesota forest fires found ready sympathizers in the sailors on the Great Lakes. There were several bulk freighters at Duluth and Two Harbors at the time of the fire and the crews of all of these vessels made voluntary contributions for the relief of the fire victims. The Lake Carriers' association reports that among others the men aboard the J. S. ASHLEY gave $127.50, the SHENANGO gave $72, and the COL. J. M. SCHOONMAKER $79.

* * *

The steamer J. H. G. HAGARTY, bound from the head of Lake Superior to South Chicago with ore, struck in the rock cut in the Soo river, Oct. 18, and punctured No. 1 tank. Her forward hold filled with water and she was forced to anchor in Mud lake while

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awaiting an air compressor sent to her from the Soo.

* * *

The Manitowoc Shipbuilding Co., Manitowoc, Wis., is planning extensive additions to its plant. The company recently acquired 750 feet of dockage adjacent to its present plant by taking over the entire holdings of the Burger Boat Co. which will establish a new plant across the river. It is reported the improvements to the Manitowoc company's plant will include a complete new foundry, employing from 100 to 150 men, and producing ship castings exclusively. Part of the recent acquisition will be used for the erection of a new fabricating building 60 x 300 feet, of brick and steel, and a paint shop 45 x 75 feet, of solid brick construction.

* * *

Drill Boat Earthquake wreck light was established Oct. 22 to mark the wreck of a drill boat sunk about three miles northeast of Dunkirk light. A fixed red lantern light is attached to a spar buoy, about five feet above the water. The wreck is in about 60 feet of water.

Atlantic Coast Notes

The steam trawler ROSEWAY, said to be the largest of the type ever built, is about to be placed in commission by Boston capitalists. She was built at Essex, Mass., and her machinery was installed at Portland, Me. The ROSEWAY is 155 feet long and registers 351 net tons. Capt. Bruce Wallace is in command.

* * *

Navigators of vessels entering Boston harbor at night complain that searchlights on harbor fortifications frequently are flashed into pilot houses, apparently without reasonable excuse. On a number of occasions, collisions have been narrowly averted when watch officers were thus temporarily blinded.

* * *

Capt. Pierce H. Lewis, formerly in charge of steamers on the Boston-New York route, has been given command of a lake-built steamship and for the present is employed in transporting coal coastwise.

* * *

Three-masted schooner CHARLOTTE W. MILLER, sunk last summer in Long Island sound, following a collision with an American submarine, has been raised, rebuilt and resumed her operations under the name of WILLIAM H. DRAPER.

* * *

Capt. Charles E. Holbrook, Tennant's Harbor, Me., commander of 3-mast schooner HATTIE E. DUNN when that vessel was sunk by a German submarine, has been appointed captain for a New York shipping concern holding a contract for handling government vessels.

* * *

The bark FLYING CLOUD, formerly the German bark OTTAWA, is reported wrecked on the Japanese coast while bound from Manila to a United States port.

* * *

Capt. H. C. Harding, master of the Boston-owned steamship NORFOLK died recently at the Marine hospital, Norfolk. He was stricken while bound from Boston for Hampton Roads. Funeral services took place at his home, Roxbury, Mass. Captain Harding was 32 years old and, for a time, was first mate of the 6-mast schooner GEORGE W. WELLS. He was born in Chatham, Mass.

* * *

Two-mast schooner OLIVER AMES, largest of her type, is being broken up at Machias, Me., for firewood. For many years she ran along the New England coast in the coal and lumber trade.

* * *

The cause of the loss of the steamship ALCOR, sunk last June while bound from Boston for Bordeaux, France, with a cargo of flour substitutes for the Swiss government, has been determined. The ship struck an uncharted rock in 18 feet on Mud Island shoal, off Yarmouth, N. S. The obstruction has been named after the ill-starred freighter.

* * *

The river steamer ST. JOHN, which was recently sunk in a collision at Norfolk, Va., has been floated and anchored in Norfolk harbor.

Along the Pacific Coast

CONDITIONS in the export business on the Pacific coast have become so acute that an appeal has been made to the war trade board requesting modification of some of its embargo regulations. Exporters find themselves swamped with cargo and unable to obtain space except at rates that appear prohibitive. The war trade board has recently placed sweeping embargoes on Oriental goods. Consequently there is a dearth of cargoes coming to the Pacific coast. On the other hand, freights from there to the Orient are skyrocketing, inasmuch as westbound and eastbound freights in the Pacific always act in sympathy with each other. In other words, a fall in one direction means an advance in the other direction as Japanese owners are careful to maintain about the same returns for each voyage. For this reason westbound freights have advanced from $30 to more than $40 with a tendency to advance still more. Japanese owners have not been sending their vessels into the Atlantic but are diverting their ships to the profitable routes in Indian waters. The regular lines will continue to ply to North Pacific ports but the increase in westbound freights will cover the decline in eastbound rates. Consequently exporters are up in arms and are seeking relief.

* * *

Drastic rules laid down by Gov. Thomas Riggs in an effort to prevent the spread of influenza in Alaska, resulted in that territory being deprived of all steamship service from Puget sound for several days. Governor Riggs ordered that no patient should be sent ashore in Alaskan ports and in consequence the steamship lines cancelled their sailings. The rule was speedily modified so that patients will be admitted to the hospital at Juneau, Alaska. When the governor announced the change, the sailings were resumed and Alaska is once again in touch with the outside world.

* * *

Purchase of the fleet of freight and passenger ships of the Pacific Coast Co. was recently announced by H. F. Alexander, president of the Pacific Steamship Co. When the two fleets were merged two years ago, the vessels were taken on a charter basis. However, Mr. Alexander has been working out a plan of purchase for some time and this has just been completed. The amount involved is said to approximate $4,000,000. The deal carries with it the sale of the Pacific Coast Co.'s wharf properties in California and long-time leases on the wharf properties in Seattle and Juneau, Alaska. The Pacific Coast Co. has made no announcement as to its future plans except that the sale of its floating property will place it in a stronger financial position and will enable it to increase the scope of its activities in Seattle.

* * *

Launched at the Anderson shipyard, Kirkland, Wash., as the OSPREY, this auxiliary steamer has just been sold to the French government and has been renamed GENERAL PAU. The sister ship, OLEANDER, has also been taken by the French. Both are to be ready shortly and will load for Atlantic ports.

* * *

Alexander Stewart, for many years actively associated with Dodwell & Co., died recently, thereby removing from north Pacific shipping circles a widely known traffic man. Mr. Stewart had been for years a director of Dodwell & Co., and Pacific coast manager for the firm. He came to Puget sound in 1892 when Dodwell & Co. established the first regular steamship service between this coast and the Orient. Since that time, he has been a prominent factor in building up the enormous trade which now is permanently established between North Pacific ports, Japan and China.

* * *

The most spectacular fire Puget sound has ever seen, occurred on the night of Oct. 15 when the Great Northern oil terminals, leased and operated by James Griffiths & Sons, Seattle, went up in flames. The loss is estimated at about $1,750,000. Oriental oils in storage, valued at more than $1,000,000 were destroyed. The extensive terminals of the Great Northern railroad, occupied by the Nippon Yusen Kaisha, and those of the port of Seattle, were seriously threatened by areas of floating oil. The Oriental liner FUSHIMI MARU, which was in berth, was surrounded by fire at one time and the destruction of this liner seemed imminent. Conditions were favorable, however, and the fire was confined to the one terminal. It has not been determined whether or not the fire was of incendiary origin.

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Equipment Used Afloat and Ashore

Condenser Packing—Refrigeration Unit—Steam Superheaters—Electric Switch—Vacuum Traps—Rope and Twine

TO maintain a high vacuum is one of the problems that daily confronts the marine engineer and no matter how efficient the vacuum pump may be it cannot work to maximum efficiency unless the condenser is air tight. Various kinds of packings have been used on condenser tubes such as cotton wicking, corset lacing, etc. With the object of manufacturing a more permanent packing, the Crane Packing Co., Chicago, has developed a soft, flexible metallic packing that is said to be adapted for sealing condenser tubes.

This packing is made of thin babbitt sheets, wrapped spirally and lubricated between each layer, after which it is pressed into rings by means of dies. The accompanying illustration shows how this packing is installed. All that is necessary is to insert the desired number of rings and screw in the gland. It is said that the packing can be used several times, which eliminates installing new packing in cases where the condenser tubes require drawing.

The packing is designed to fill every crevice, which insures an air-tight condenser, a factor of importance since the efficiency of steam turbines and condensing engines depends on high vacuum. The packing, it is pointed out, resists the action of salt water, a thorough 2-year test on both land and sea having been made. It is also stated that the packing has proved efficient on evaporators and heaters.

The International Life Suit Corp. has been taken over by the National Life Preserver Co. The offices remain unchanged, 11 Broadway, New York. The officers of the company are: W. N. Hanson, president; O. A. Youngren, vice president and general manager, and James A. Watt, secretary.

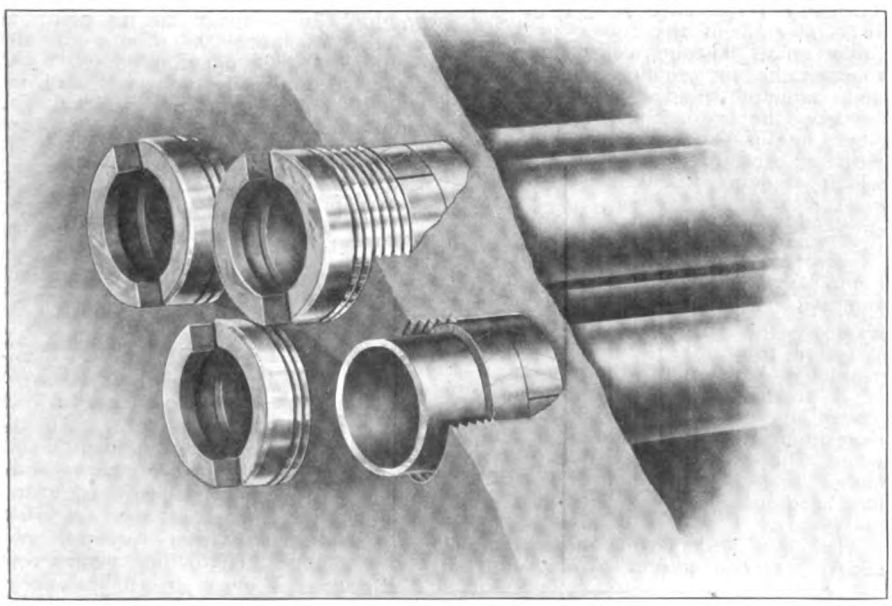
Refrigeration Unit

An interesting feature of the installation shown in the accompanying illustration, which is a product of the Refrigeration Engineering Co., Toledo, O., is that all parts are combined as one unit on a single base. The object of this is two-fold. It permits the complete outfit to be erected at the factory and thoroughly tested under actual working conditions and, again, a self-contained unit takes up less space aboard ship. The assembly includes the engine, compressor, trap, condenser, cooler, circulating pump, liquid receiver, etc., together with the necessary controlling valves, gages, relief valves, piping and the base plate.

It is said that aside from conserving space, the method of construction eliminates much of the skilled labor required in caring for the outfit on shipboard and it is pointed out that many shipbuilders install these units without outside aid.

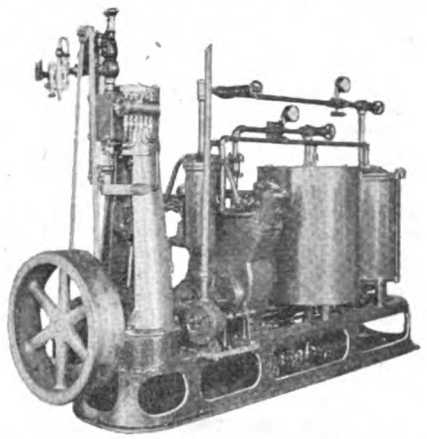
Several novel features are incorporated in the general design. The compressor is of the 2-cylinder type having valves of large area and a breaker valve located in the piston relieves the vacuum which insures cool cylinder walls. The condenser and cooler are both of the counter-current submerged-coil type with areas in excess of the capacity required. The rotary circulating pump is positive in action and is driven by chain, direct from the main shaft.

The engine is equipped with a positive sight-feed oiling system for all bearings and is of low speed for a machine of this type, being operated at 140 to 180 revolutions per minute.



METALLIC RING PACKING FOR SURFACE CONDENSER TUBES

A new type of scuttle butt is used. It is provided with cast iron heads and the hand hole is so located that the scuttle may be readily flushed and cleaned.



SELF-CONTAINED REFRIGERATION INSTALLATION

Steam Superheaters

An attractive 54-page catalog devoted to steam superheaters has been issued by the Power Specialty Co., New York. The superheaters are designed for both marine and land installations.

The superheating of steam is now recognized as an important factor in the economical use of steam as in the production of power, steam forms the link between the heat liberated by combustion and the steam engine which converts the energy generated into rotary motion. The discovery that steam could be superheated and thus made more economical in operation has had far reaching effects.

The process of superheating is simple—the steam as generated in the boiler can be increased in temperature without an increase of pressure and as superheated steam contains no moisture, as does saturated steam, it is more economical in operation.

It is pointed out that to secure the best results, a superheater should be carefully designed for the work required of it. It is necessary to know the quantity of steam to be superheated and the amount of the superheat desired; also the temperature of the furnace gases where they will strike the superheater.

The catalog contains numerous illustrations showing installation of superheaters, together with directions for installation, and numerous charts drawn up from actual tests. Several illustrations of vessels in which the company's superheaters have been installed are also included. In the back of the catalog are two tables of interest to engineers; carrying capacity of extra-heavy steam pipes and properties of steam.

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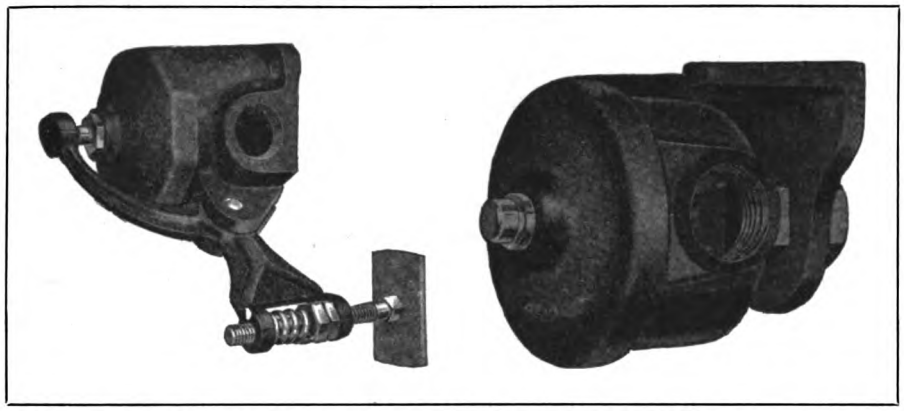
Watertight Door Switch

On all vessels traversing the sea in war time, it is essential that the interiors be lighted adequately. It is also essential that the decks and exterior of the ship be entirely in darkness, except for such enclosed lights as are necessary for running.

To open the door from a passage way upon the deck, without at the same time putting out the light, would be likely to transmit a signal to a waiting submarine. The door switches illustrated are designed, therefore, for the purpose of instantaneously extinguishing the light when the door leading to the deck is opened, even slightly.

The devices are watertight and are made rugged throughout in order to stand up under marine service. The mechanisms are positive and quick in action. Less than a ¼-inch movement in the door actuates the switch and makes or breaks the circuit.

They are made in two types, termed direct acting and indirect acting. In the direct acting, the plunger impinges directly against the door. In the indirect acting, the door actuates a lever plunger protected by a spring against sudden slams or shocks. Both types are adjustable for any direction of conduit entrance, and may also be adjusted for varying widths of door frame. They are manufactured by the Benjamin Electric Mfg. Co., Chicago.



AT THE RIGHT IS SHOWN THE DIRECT ACTING TYPE OF SWITCH—THE SWITCH SHOWN AT THE LEFT IS ACTUATED BY MEANS OF A LEVER

Makes Rapid Progress

An insight into how work on turbine engine production is being expedited at the Essington, Philadelphia, plant of the Westinghouse Electric & Mfg. Co., can be gained from the following production figures. In September, shipments were almost as large as in all previous months combined, the figures running back to the time the company began production. As far as the turbines and gears are concerned, there were as many turned out in September as in all previous months since the Essington works were organized.

Up to and including June, 1 turbine, 2 gears, 4 main condensers, 4 auxiliary condensers, 2 circulating pumps and 9 propeller shafts were completed. During July, 1 turbine, 2 main condensers, 7 auxiliary condensers, 2 circulating pumps and 3 propeller shafts were finished. In this month, however, no gears were produced. During August, 6 turbines, 6 gears, 6 main condensers, 9 auxiliary condensers, 3 circulating pumps and 11 propeller shafts were completed. In September, 8 turbines, 8 gears, 13 main condensers, 8 auxiliary condensers, 5 circulating pumps and 15 propeller shafts were finished.

This material was furnished to the Submarine Boat Corp., Newark, N. J. Aside from this, the Westinghouse company furnished 12 merchant-type auxiliary condensers to Bristol, Pa., and Newburgh, N. Y., shipyards and 2 reduction gears to the United States navy.

Vacuum Traps

A folder devoted to vacuum traps has been issued by the Ohio Blower Co., Cleveland. By the application of two forces, gravity and buoyancy, it is said that the mechanism of the trap has been simplified to a point where there are but two moving parts. It is pointed out that when the trap is used in connection with a vacuum heating system, it is necessary to use a vacuum attachment. This device consists of a small expansion valve so constructed that when the trap cools off, because air has collected in the upper part, the valve opens automatically and thus releases the air, which is removed by the vacuum pump. When steam reaches the valve it automatically closes again. The folder is illustrated with a sectional view of the trap which explains its action clearly.

Builds Large Boiler

The New York Engineering Co., New York, has been awarded a contract by the United States navy for a water tube marine boiler, of unusual size and built for high pressure. It is to be installed in the United States naval academy's engineering experiment station, Annapolis, Md., where there is now a boiler of the same size and in similar type which has been in service for the past several years.

The new boiler will contain 5000 square feet of heating surface, and is to be built for a working pressure of 350 pounds. It is to be equipped for burning oil, and will use the navy standard oil burner. The boiler will be completely assembled in the shop where it is built, and shipped complete without being knocked down.

The New York Engineering Co. has just completed a new shop, which is equipped with machinery specially designed for building this particular type of boiler. This shop, which is located at Yonkers, N. Y., directly on tidewater, will have a capacity of 200 boilers a year.

Rope and Twine

The American Rope & Twine Co., Brooklyn, N. Y., has issued a catalog devoted to its products which consist of rope and twine made in various sizes for use on land and sea. The company's products are made of three materials—manila hemp, sisal fiber and jute. Manila hemp is grown solely in the Philippine archipelago and is obtained from abaca or lanut which is a species of wild banana plant. Sisal hemp comes from the province of Yucatan, Mex., and derives its name from the fact that up to the year 1871 the town of Sisal was the only port of entry in Yucatan. This material is derived from the heniquen plant, a fibrous growth with sword-like leaves. Jute comes from India and is one of the most important fibers from which cordage is made.

The catalog contains much interesting information concerning these raw materials and a description of how they are prepared and worked up into finished products. The difference between several kinds of ropes such as plain and cable laid are explained and several illustrations are included which show the processes of preparing material and manufacturing it into rope.

Among the marine specialties made by the company are: Buoy lines, fishermen's cables, canal lines, cargo nets, wrecking lines, sail rope, steamship lines, stevedore rope, block-and-fall rope, wheel rope, raft rope, towing hawsers, yacht rope, marline, ratline and oakum.

Increases Capacity

The Thomas Spacing Machine Co., Pittsburgh, and Glenshaw, Pa., is building an addition to its plant at a cost of $100,000. Some of the equipment has been purchased and some of it already delivered and installed. The plant is modern, the buildings being of steel and fireproof construction. The company builds spacing tables, multiple punches and other shipyard and structural steel and boiler shop equipment. The officers of the company are: George P. Thomas, president; J. S. M. Phillips, secretary and treasurer; F. C. Stiening, chief engineer; J. H. Keefer, superintendent.

James Howden & Co., Ltd., Glasgow, Scotland, with American offices in New York, recently purchased a plant in Wellsville, N. Y., for the manufacture in this country of their products, which comprise forced-draft apparatus, water-drum boilers, furnace fronts, smokebox door fastenings, steam turbines, generator engines, circulating pumps, etc. The company's object in establishing an American branch was to expedite deliveries in this country and Canada.

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THE MARINE REVIEW

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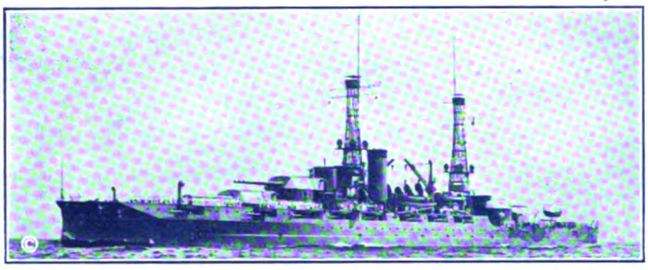

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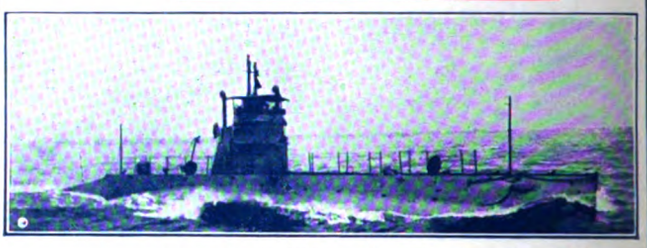

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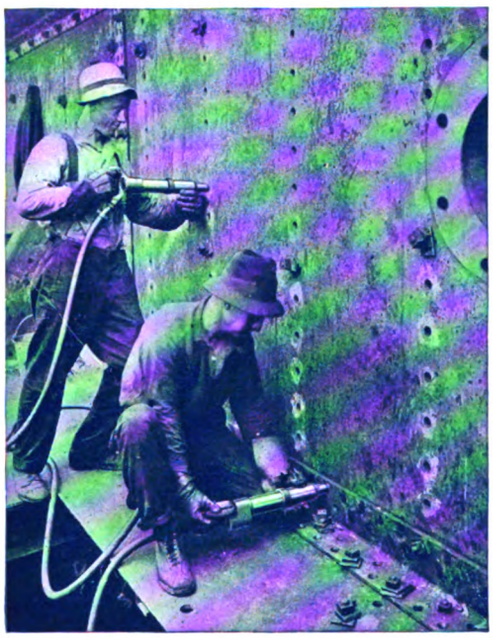

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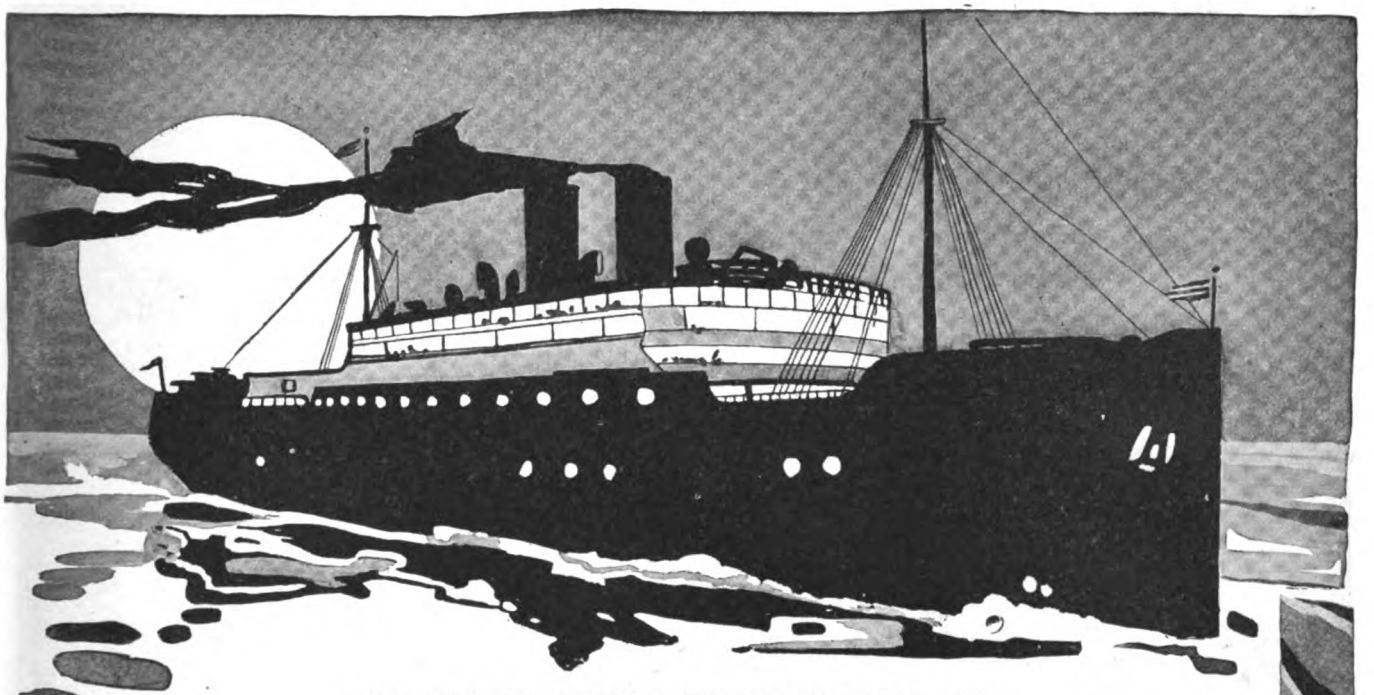

CLEVELAND—NEW YORK, DECEMBER, 1918

THE MARINE REVIEW

A Monthly Publication Devoted to Shipbuilding, Marine Engineering and the Business of Transportation by Water.

Published by The Penton Publishing Co., Cleveland, Ohio, U. S. A.

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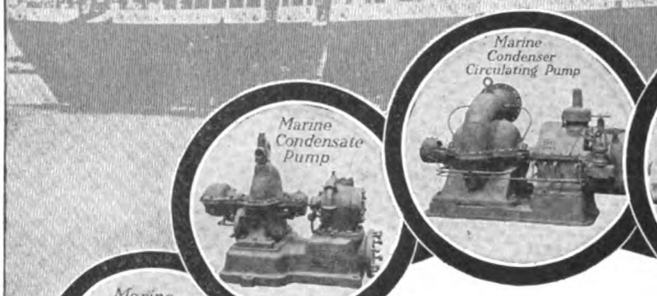
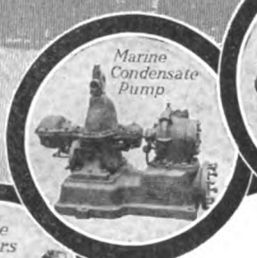
Westinghouse
Marine Equipment





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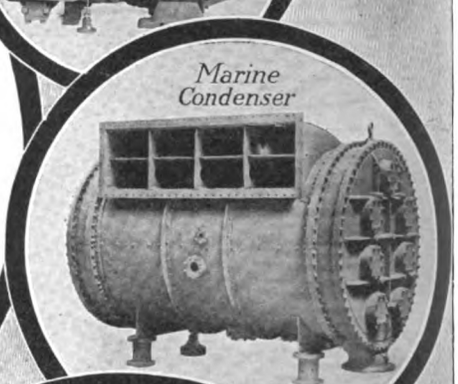

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Steam Turbines and Reduction Gears

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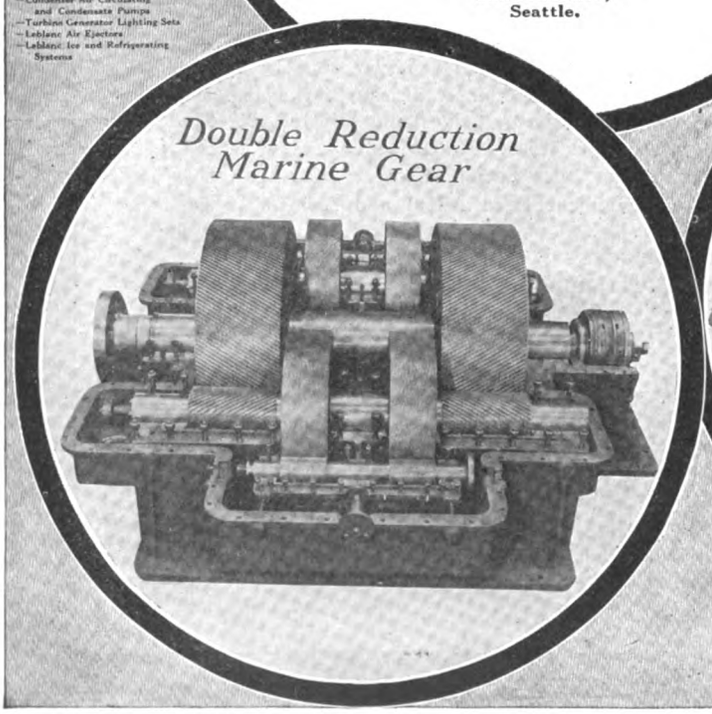

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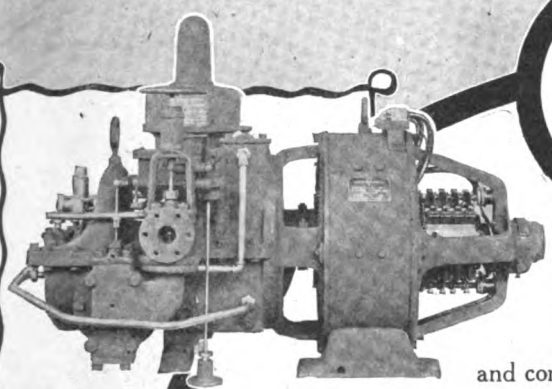
Electricity On Shipboard



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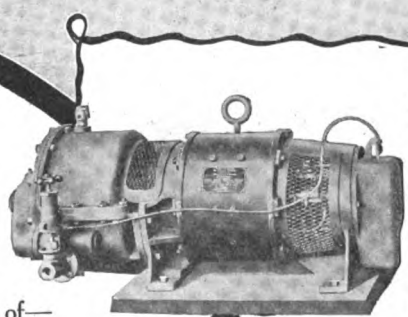

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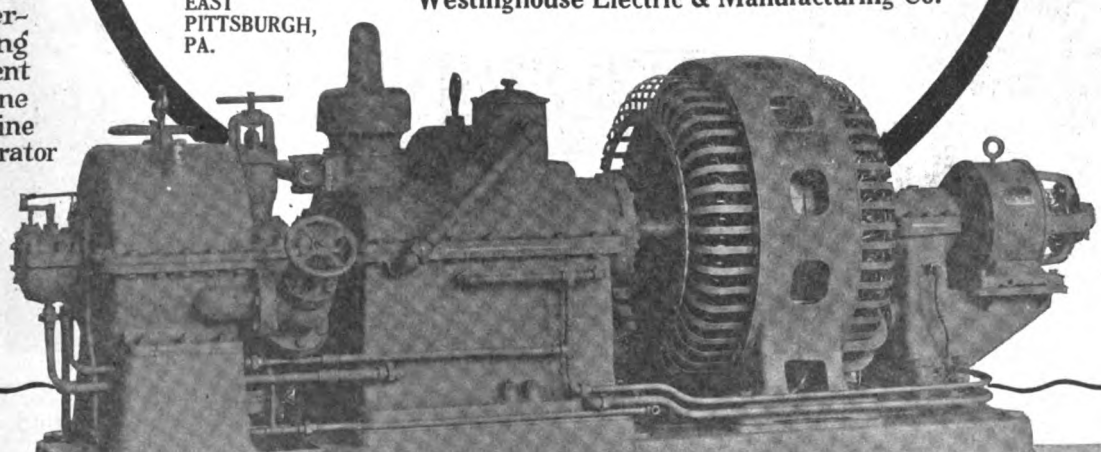

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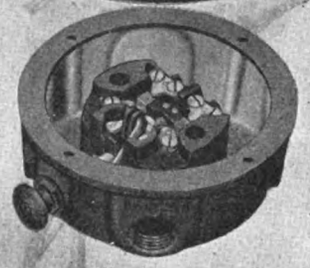
BENJAMIN and

Marine Lighting and Signaling Apparatus

Twin Receptacle In Watertight Box


Double Pole Switch In Watertight Box

Single Key Receptacle In Non-Watertight Box

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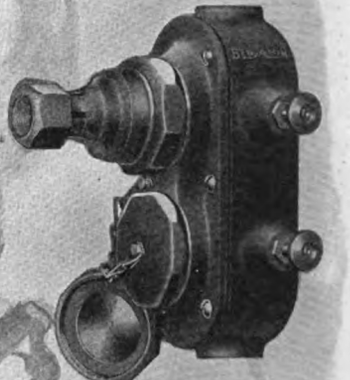
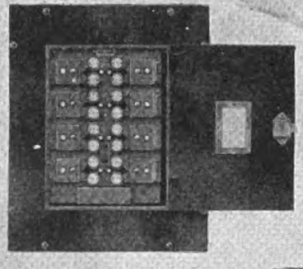


Watertight 2-Gang Outlet Box Receptacles and Plug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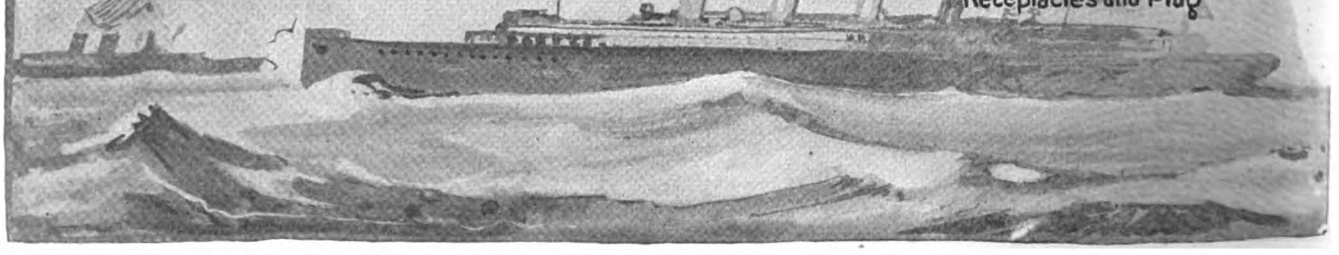

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Watertight Angle Fixture

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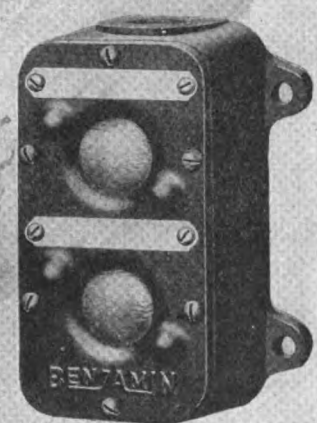
Watertight Single Button



Watertight 2-Gang Button

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KLAXON COMPANY
INDUSTRIAL DIVISION
DEPARTMENT A1

Intercommunication and Signal Engineers

33 WEST 42D STREET NEW YORK, N. Y.

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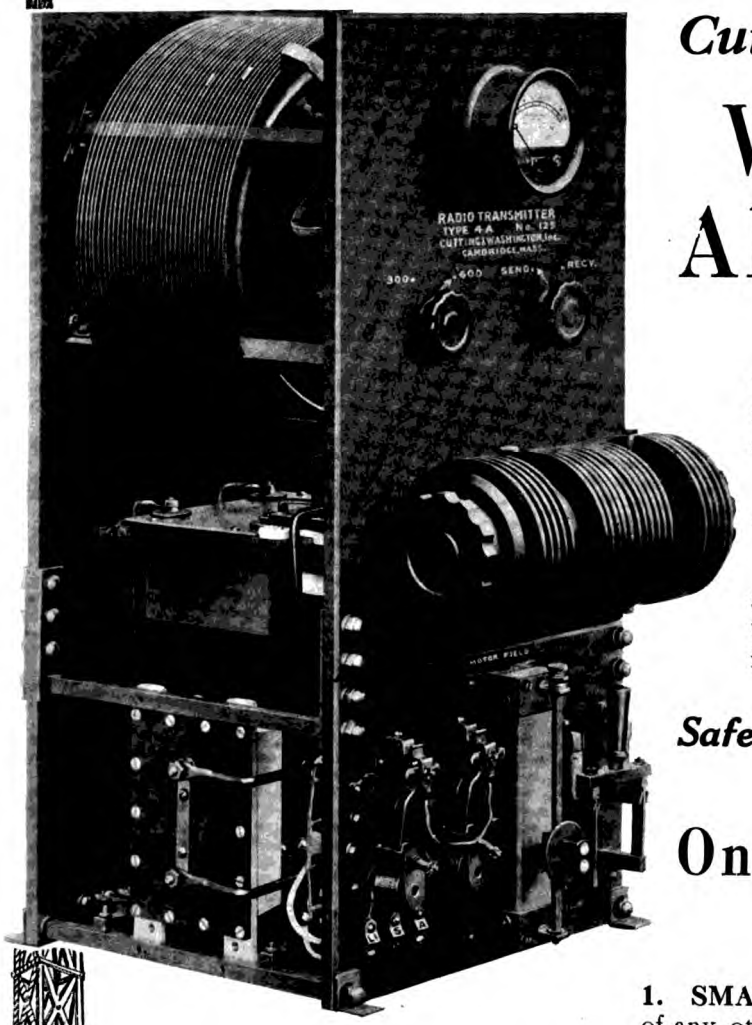

½ K. W. Transmitting Set
(Front View)

Dimensions 28½" high, 14" wide, 18" deep, weight 99 pounds.

Standard Sizes 0.3 Kw., 0.5 Kw. and 2 Kw.

Complete information will be sent upon request.

Cutting & Washington
INCORPORATED
Radio Apparatus
747 Main Street
Cambridge, Mass.

Cutting & Washington

WIRELESS APPARATUS

Wireless telegraphy can be used under conditions where no other means of communication are possible.

Its advantages on land are almost as many as on water.

C & W radio apparatus is of great value to yachts, house boats, tugs, fishing boats, passenger and freight steamers and the NAVY.

Safety, Convenience, Pleasure and Business

On Land and Water

Distinctive Features

1. SMALL SIZE. Occupies but ¼ the space of any other system with equal power; weigh only half as much.

2. SIMPLICITY. Anyone who knows the code can operate a C & W set. Any competent electrician can install it. Has but 1/10 the parts of other systems.

3. LOW COST. Because of its simplicity and small size, its price is remarkably low. Because of its rugged construction, maintenance expenses are practically eliminated.

4. VARIED USES. Its low cost, simplicity and durability make it available under hundreds of conditions on land where telephone and telegraph wires cannot be strung; and on small craft, as well as large.

5. SAFETY. Only 200-volts gap voltage, where other sets use 8,000 to 30,000 volts.

6. QUIETNESS. The sound, in operation, can hardly be heard through an ordinary closed door.

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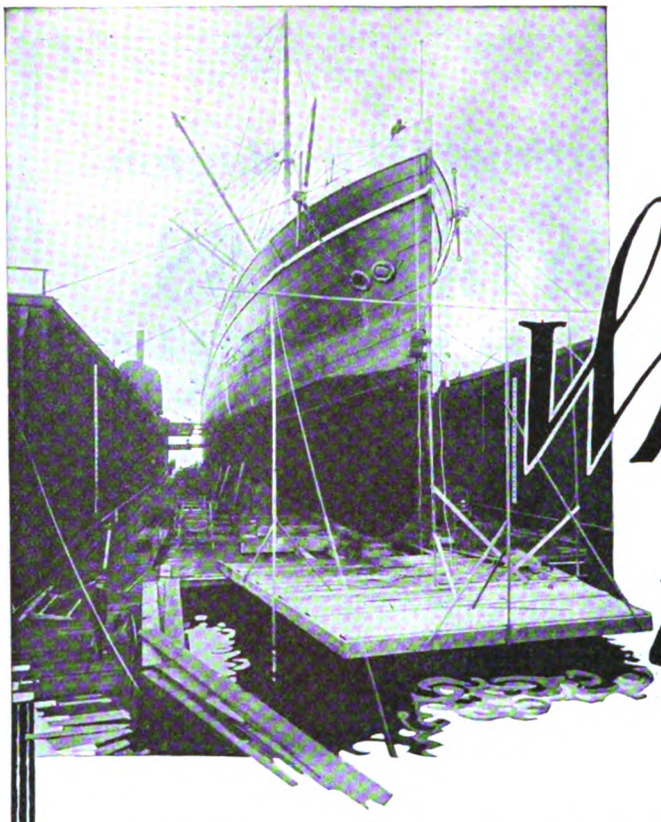

Who pays the Bill?

WHEN your ships go into drydock for repairs that might have been avoided by prompt communication, *who pays the bill?*

When your ships log useless miles, *who pays the bill?*

When your vessels arrive in port needing repairs for which you are unprepared, *who pays for the time lost?*

When your ships lose the chance to pick up salvage worth hundreds of thousands, *who is the real loser?*

When your ships lay-to and await for days for a tow, *who pays the bill?*

Isn't it you—*the owner*—that suffers these losses?

With a small initial outlay for a Kilbourne & Clark Radio set all these losses would be avoided. It costs scarcely nothing to operate a "K-C" set. You buy the apparatus outright. The first cost is the last. After that each set starts to make money for the ship owner.

"K-C" Radio sets the pace for ruggedness, efficiency, range and power.

May we send you additional particulars and show you why "K-C" Radio is technically superior?

KILBOURNE & CLARK MANUFACTURING CO.

Factory and General Offices
Railroad Avenue and Spokane
Seattle

Cable Address
"KILBOURNE"

Kilbourne & Clark RADIO

149 Broadway
New York City

Fife Building
San Francisco

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MARCONI

WORLD—WIDE WIRELESS

The Marconi Rental Contract covers installation, operation, and maintenance of wireless apparatus on vessels.

We assume responsibility for repairs and upkeep; we maintain land stations at vital points, providing adequate and efficient means of receiving or transmitting messages anywhere; and we solve the difficult problem of securing competent licensed operators by training men in our own organization. This training includes not only technical instruction, but also mastery of traffic and accounting details and of the complexities of Government regulations.

The ship-holder's sole obligation in return for this world-wide and exceptionally complete service, is the payment of a moderate monthly rental. Our representative will call upon invitation, to explain the Marconi Plan in detail.

Factory Facilities for Developing and Manufacturing Wireless Equipment

To maintain the prestige of the Marconi Service constant improvements in wireless apparatus are being made. Few branches of electrical science have progressed as rapidly as wireless telegraphy, and the very latest inventions are at once incorporated into Marconi equipment.

Back of this development and manufacture is a highly specialized organization of over six hundred employees engaged in a modern factory of some 39,000 square feet of floor space. Here a body of technical men constitute the Marconi Research Department. New methods and improved apparatus are under continual test and many notable advances in the radio art are constantly being made in this department.

Without this manufacturing organization, combined with its Traffic and Operating Departments, Marconi Service would not represent to the shipowner and public the complete and up-to-date service which has stood the test for twenty years and which means more to the individual shipowner by its ever broadening influence.

Marconi Wireless Telegraph Co. of America

Executive Offices:
233 Broadway
New York City

Cleveland Office:
Schofield Building
Cleveland, Ohio

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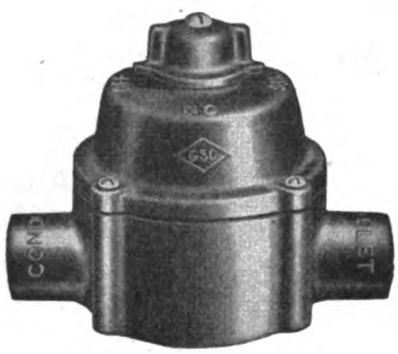
Complete Protection *for* SNAP SWITCHES



Type GSC Condulet

"Here's another new Condulet — Type GSC. It's a dandy and lets me use a snap switch on this outdoor installation.

"No dust or moisture can get inside the Condulet and the thumb knob can't be broken off. The indicating feature is preserved, too."

Type GSC is only one of a complete series of protective Condulets for snap switches. They are especially suited to out-of-door, marine, garage, refinery, and textile and flour mill installations.

Write for new Condulet Bulletin No. 1000-I
You will find it valuable

CROUSE-HINDS COMPANY
SYRACUSE, N. Y., U. S. A.
NEW YORK BOSTON CHICAGO

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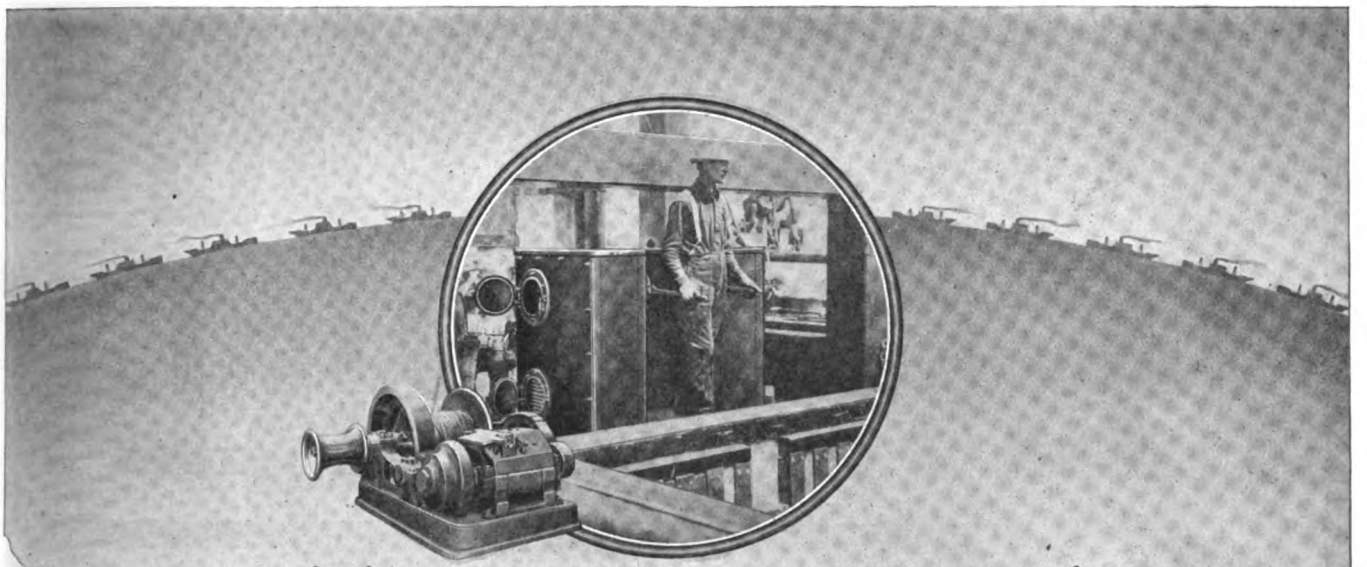

Modern Terminal Handling Facilities Will Keep Our Ships on the Seas

On the Great Lakes modern terminal loading and unloading equipment is making one ship equal to two on thousand mile hauls and rendering it possible for steel companies to produce seven times as much ore per man as is being done in Europe with hand shovelling methods.

Electric motor driven winches, cargo cranes, package conveyors, trackless trains, trucks and locomotives will, with the fabricated construction, keep our ships on the sea as the following achievement indicates.

By improved handling devices and better organization of cargo, seventeen days have been cut off the time spent in port by our ships on European trips. In the case of a 14,000 ton passage and cargo liner such a saving amounts to practically a 2,000 ton ship.

You are invited to get in touch with our engineers, located in all large cities, and learn how electric power can reduce the turn-round of your ships.

GENERAL ELECTRIC COMPANY

GENERAL OFFICE: SCHENECTADY, N.Y.

Atlanta, Ga.	Cincinnati, Ohio	Erie, Pa.	Los Angeles, Cal.	*Oklahoma City, Okla.	San Francisco, Cal.
Baltimore, Md.	Cleveland, Ohio	*El Paso, Tex.	Louisville, Ky.	Omaha, Neb.	Schenectady, N. Y.
Birmingham, Ala.	Columbus, Ohio	Fort Wayne, Ind.	Memphis, Tenn.	Philadelphia, Pa.	Seattle, Wash.
Boston, Mass.	*Dallas, Texas	Hartford, Conn.	Milwaukee, Wis.	Pittsburgh, Pa.	Spokane, Wash.
Buffalo, N. Y.	Dayton, Ohio	*Houston, Texas	Minneapolis, Minn.	Portland, Ore.	Springfield, Mass.
Butte, Mont.	Denver, Colo.	Indianapolis, Ind.	Nashville, Tenn.	Providence, R. I.	Syracuse, N. Y.
Charleston, W. Va.	Des Moines, Iowa	Jacksonville, Fla.	New Haven, Conn.	Richmond, Va.	Toledo, Ohio
Charlotte, N. C.	Detroit, Mich.	Joplin, Mo.	New Orleans, La.	Rochester, N. Y.	Washington, D. C.
Chattanooga, Tenn.	Duluth, Minn.	Kansas City, Mo.	New York, N. Y.	St. Louis, Mo.	Youngstown, Ohio
Chicago, Ill.	Elmira, N. Y.	Knoxville, Tenn.	Niagara Falls, N. Y.	Salt Lake City, Utah	

ADDRESS NEAREST OFFICE

*Southwest General Electric Company. For CANADIAN BUSINESS refer to Canadian General Electric Company, Ltd., Toronto, Ont.
GENERAL FOREIGN SALES OFFICES: Schenectady, N. Y.; 120 Broadway, New York City; 83 Cannon St., London, E. C., England

43-84

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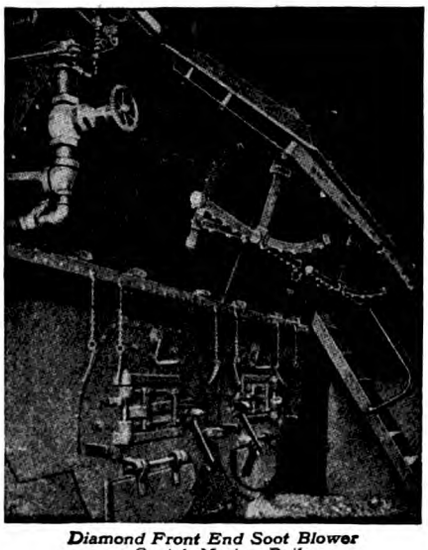
FIGHT SOOT SUCCESSFULLY

DIAMOND SOOT BLOWERS are the practical solution to the all important marine problem of fighting soot successfully. This mechanical equipment makes boiler cleaning at frequent intervals, whether in port or in transit, so simple and so thorough that most users are astonished at the fuel economy and increased boiler efficiency effected.

Mr. A. G. Mattsson, Consulting Engineer, Great Lakes Engineering Works, who has specified Diamond Soot Blowers for many marine boilers, says:

"I believe that steamers fitted with a high class Mechanical Soot Blower are *Operated with a 5 Per Cent higher efficiency* than when using the hand blower."

DIAMOND SOOT BLOWERS SAVE 5 PER CENT OF FUEL



Diamond Front End Soot Blower on Scotch Marine Boiler

Not only this, but they increase boiler efficiency and prevent corrosion of tubes.

Among hundreds of marine users of Diamond Soot Blowers on the Great Lakes and the Coasts are:

- Pittsburgh Steamship Co.
- Lehigh Valley R. R. Co.
- Ashley & Dustin
- Great Lakes Engineering Works
- Cleveland Cliffs Iron Co.
- Chicago, Duluth & Georgian Bay Co.
- Boland & Cornelius
- Cuba Distilling Co.
- Coastwise Transportation Co.
- White Star Line
- Boston-Virginia Transportation Company
- International Mercantile Marine
- Newport News Shipbuilding & Drydock Co.
- Ocean Freight Line
- Central Railroad of New Jersey
- Baltimore, Chesapeake & Atlantic Railway Co.
- A. H. Little & Co.
- Pickands Mather Co.

"How Some Ship Owners Have Increased Their Profits"

"Your profits" is the mission of the book illustrated above. The information it contains reduces to a simple plan the practicability of your duplicating the experience of vessel owners, mentioned here. Ask for your copy of this interesting book on a post card NOW. State the type and size of boilers you are operating, and give the name of your Company. The edition of "How Some Ship Owners Have Increased Their Profits" is limited, so don't delay your request. There's no obligation incurred.

DIAMOND POWER SPECIALTY COMPANY

Largest manufacturers of mechanical Soot Blowers in the world

DETROIT, MICHIGAN

Ask for catalogue and blue prints of Diamond Soot Blowers for all types of marine water-tube boilers. We equip all boilers.

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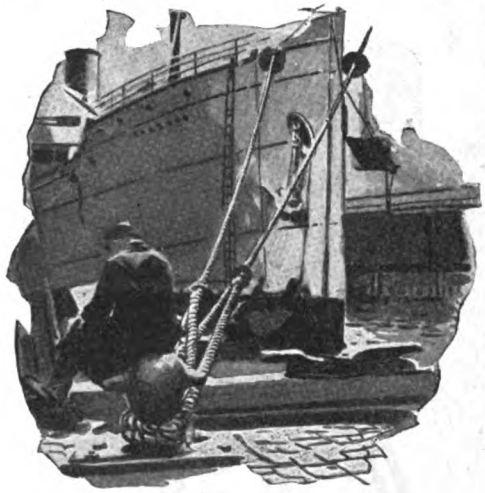
WATERBURY CORDAGE

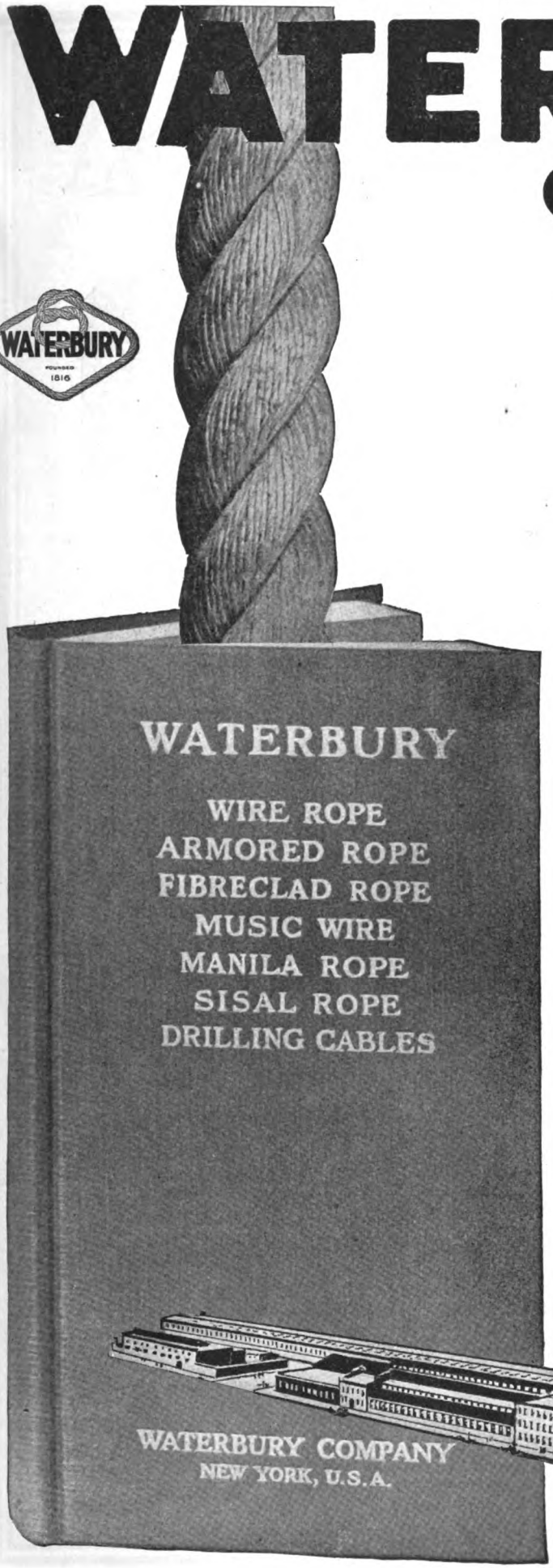


The word "Cordage" is used in a comprehensive sense to include all sizes and varieties of the article from boat-falls to hawsers 15 inches in circumference. With this definition in mind you can appreciate the significance in the fact that we manufacture a complete line of Cordage products which since 1816 have been known for their invariable high quality and splendid service.

Millions of feet of Waterbury Cordage, both Manila and Sisal, have been sold for marine uses and thousands of buyers will have no other.

CATALOG

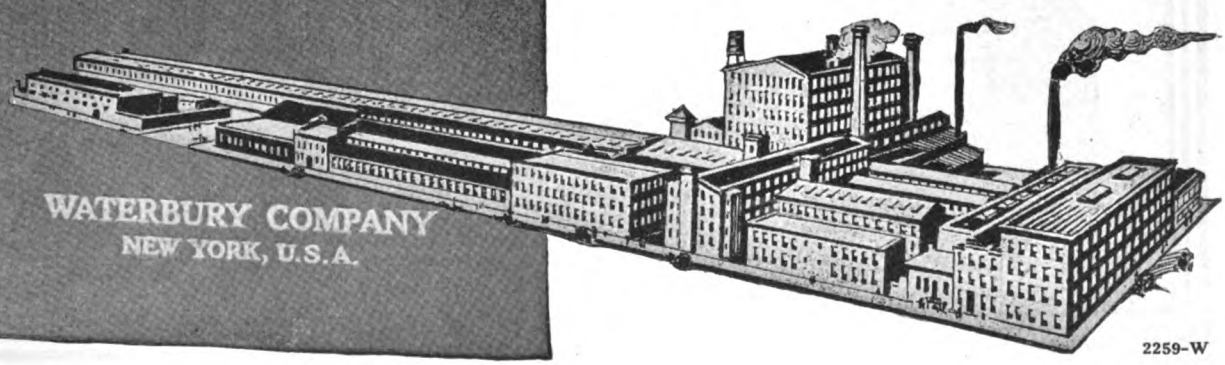
A 220 page Cloth Bound Rope Manual covering all kinds of rope — Fibre, Wire, Fibreclad Wire, and Armored Wire — will be mailed free upon request.



WATERBURY COMPANY

63 PARK ROW, NEW YORK

DALLAS, TEX., A.T. Powell & Co., NEW ORLEANS, 1018 Maison Blanche Bldg.
CHICAGO, 1315-1321 W. Congress St. SAN FRANCISCO, 151-161 Main St.



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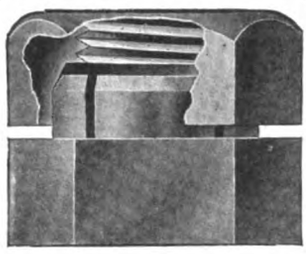
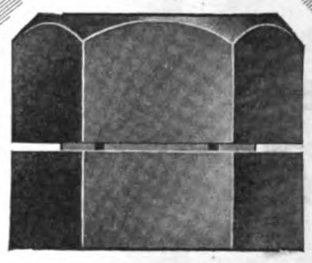
DRAKE LOCK-NUTS

TRADE MARK REGISTERED U.S.PAT. OFF.





Sold Around the World
from San Francisco

NOW MADE IN CLEVELAND

(PRODUCTION CAPACITY UNLIMITED)

THE DEMAND REQUIRED IT

BUY W. S. S.

EARLY DELIVERIES—

¼ to 1" S.A.E.

WRITE TODAY FOR SAMPLE

¼ to 2" U.S.S.

Whitworth Standard Threads
British Standard Fine Threads } to order

BUY W. S. S.

"A MICROMETER ADJUSTMENT THE FIRST TURN UP"

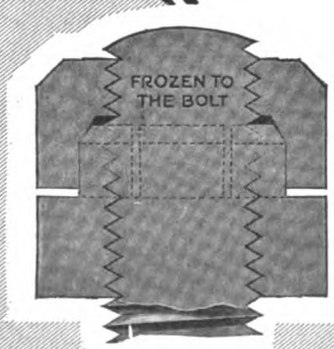
"TIME SAVED IN APPLICATION PAYS THE COST"

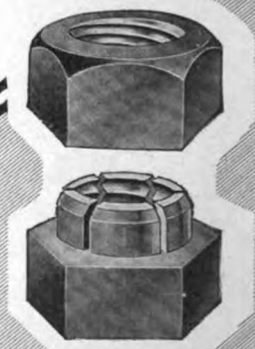
SECURELY LOCKED
"Never Jars Loose"

SIMPLE . PRACTICAL MECHANICAL

DRAKE LOCK-NUT CO. of Ohio
CLEVELAND, OHIO, U. S. A.

Pacific Coast Plant and Office
DRAKE LOCK-NUT CO.
SAN FRANCISCO, CAL.





PATENTED
United States, Sept. 19, 1916, 1,199,031
" " July 2, 1918, 1,271,449
Great Britain, Feb. 12, 1917, 106,449
France, March 3, 1917, 484,675
Italy, March 5, 1917, 465,247

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"AMERICAN"

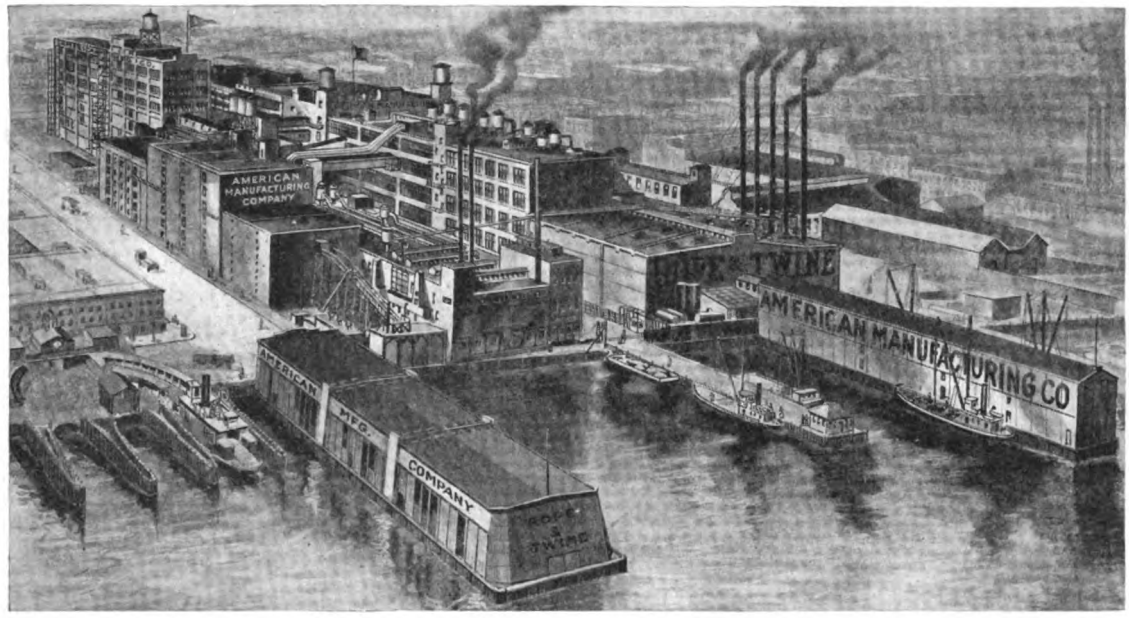
No. 1 BEST NAVY OAKUM

Made according to Bureau of Standard Specifications and so guaranteed by us.

"AMERICAN"

MANILLA ROPE

The favorite rope of the marine field



Write for Prices to

American Manufacturing Co.

Noble and West Streets **Brooklyn, New York City**

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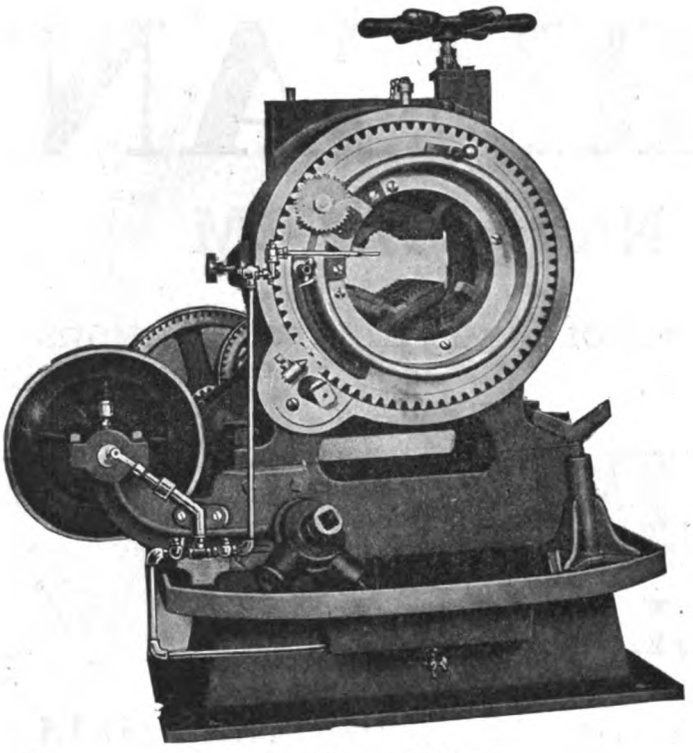

No. 258 Direct Connected Machine,
Range 1 to 6 inches, R. H.

How About That Pipe Threading?

You are going to get caught if you don't order a machine at once. You may not be ready yet for this work, but you will be soon and you will find it difficult to get a machine for quick delivery. We can make prompt deliveries NOW but we are gradually getting swamped and soon deliveries will be way ahead and prices are advancing.

Let us have your order NOW and we will make delivery when you are ready.

The Curtis & Curtis Co.
525 Garden Street Bridgeport, Conn.

"The Utmost in Rope Value"

A large southern shipbuilding company, after trying out most of the well-known brands of Manila Rope and finding Whitlock All-Manila superior to the others in every good rope quality, desired to confine their purchases to our goods.

On learning that it would be almost impossible for us to supply their requirements they offered us a large premium over the regular current price of Whitlock All-Manila, or any other brand of rope on the market.

We could not accept the business in view of urgent government demands and the needs of our old established trade, but the offer mentioned above "speaks volumes" for the value of Whitlock All-Manila Rope.

The Rope that Endures
WHITLOCK
TRADE MARK
ALL-MANILA

Department C
WHITLOCK CORDAGE COMPANY
46 South Street, New York

Branches:
CHICAGO and KANSAS CITY

Factory and Warehouses:
JERSEY CITY, N. J.

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Planning for War —and Peace

In the field of manufacture, as on the field of battle, American strategy has been a big factor in the winning of the war.

Our fighting men at the front, and our fighting men back of the front, down to the humblest of the workers in shop and shipyard, have given heroic demonstrations of their courage, initiative, resourcefulness and spirit of self-sacrifice.

Our war plans have made good. But what about our Peace plans?

Now that the Unconditional Surrender of the Hun looms as an imminent possibility, with its accompanying cessation of war orders and the resumption of intense competition, what does it mean to us industrially? Is it a threat or a promise?

We believe it is a promise—but only to those who continue to seek diligently *now* for better methods of management and production.

Looking over our own record of the war plans in the making and carrying out of which the Keller organization has been privileged to co-operate, it is gratifying to realize that while we have been working for the success of the Allied cause, we have also been working for the post-war success of ourselves and our customers.

By striving steadily to increase our production of Keller-Made Master-Built Pneumatic Tools, and to improve the tools themselves so that they can be depended upon to increase the production of the Shipyards, Shops and Foundries using them, we have not only "done our bit" to render certain the outcome of the great Battle for Democracy, but have at the same time and to the same extent helped to pave the way for the winning of the great Battle for World Trade that is to follow.

Preventable inefficiency is Treason during the war. After the war it will be Business Suicide.

KELLER-MADE
PNEUMATIC TOOLS
MASTER-BUILT

William H. Keller *President*

KELLER PNEUMATIC TOOL COMPANY, GRAND HAVEN, MICH., U. S. A.

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When They Pass The Inspector—

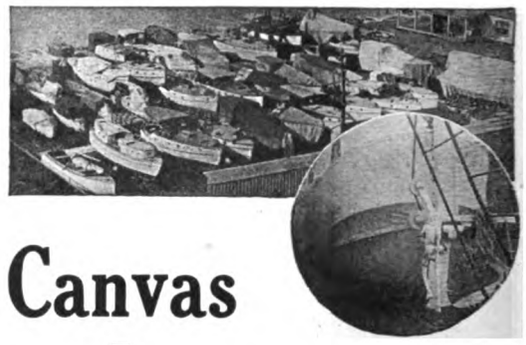
Then: They're *good.* No bolt, nut or rivet is shipped from this factory until close inspection has shown it to be flawless.

To make them ALL that way, and maintain a leadership that dates back to '45, requires a grade of materials and a type of mechanical equipment far above the average.

High grade steel stock is obtainable by anyone. But there are certain manufacturing facilities here which no other bolt and nut maker possesses—ingenious automatic machinery designed by our own engineers for our own use.

But these are only *part* of the reason for the supremacy of EMPIRE products. For one must look to the intangible something—the *policy*—for much of the resources that make such quality possible.

RUSSELL, BURDSALL & WARD
BOLT & NUT COMPANY
PENBERWICK, CONN PORT CHESTER, NEW YORK ROCK FALLS, ILLINOIS
Makers of Bolts, Nuts and Rivets Since 1845



Canvas Insurance

Waterproofed canvas for engine covers, hatch covers, deck covers, life boat cover, laying-up covers and for protecting cargoes and equipment is an absolute necessity in marine work.

Today, with the great need for conservation, absolute protection is doubly important. Never before has protection of marine equipment been so necessary as it is today. And never before has PRESERVO meant so much in real economy as it does today.

The use of PRESERVO means the best possible insurance for your canvas covers; because PRESERVO not only makes canvas actually waterproof but also ***preserves*** the fabric—makes it proof against mildew and decay, and practically doubles its wearing qualities. Moreover, Preservoed canvas is not effected by rain, hail, sleet or snow. Ice will not adhere to Preservoed canvas and it is an efficient fire deterrent and prevents spontaneous combustion.

Be sure that your laying-up covers are treated with PRESERVO. The cost is surprisingly low and PRESERVO is easily applied to new or old canvas.

Ask your ship-chandler or canvas goods dealer about PRESERVO or write our nearest dealer for special literature.

Robeson Preservo Company
(formerly Robeson Preservo Products Co.)
White Block Port Huron, Mich.

Eastern Branch:
357 Western Ave., Boston, Mass.

Canadian Branch:
Sarnia, Ont.

The Hunter-Johnson Company, 311 California St.
San Francisco, California
Distributors for the Pacific Coast

Preservo Trade Mark Registered Waterproofs and Preserves Canvas

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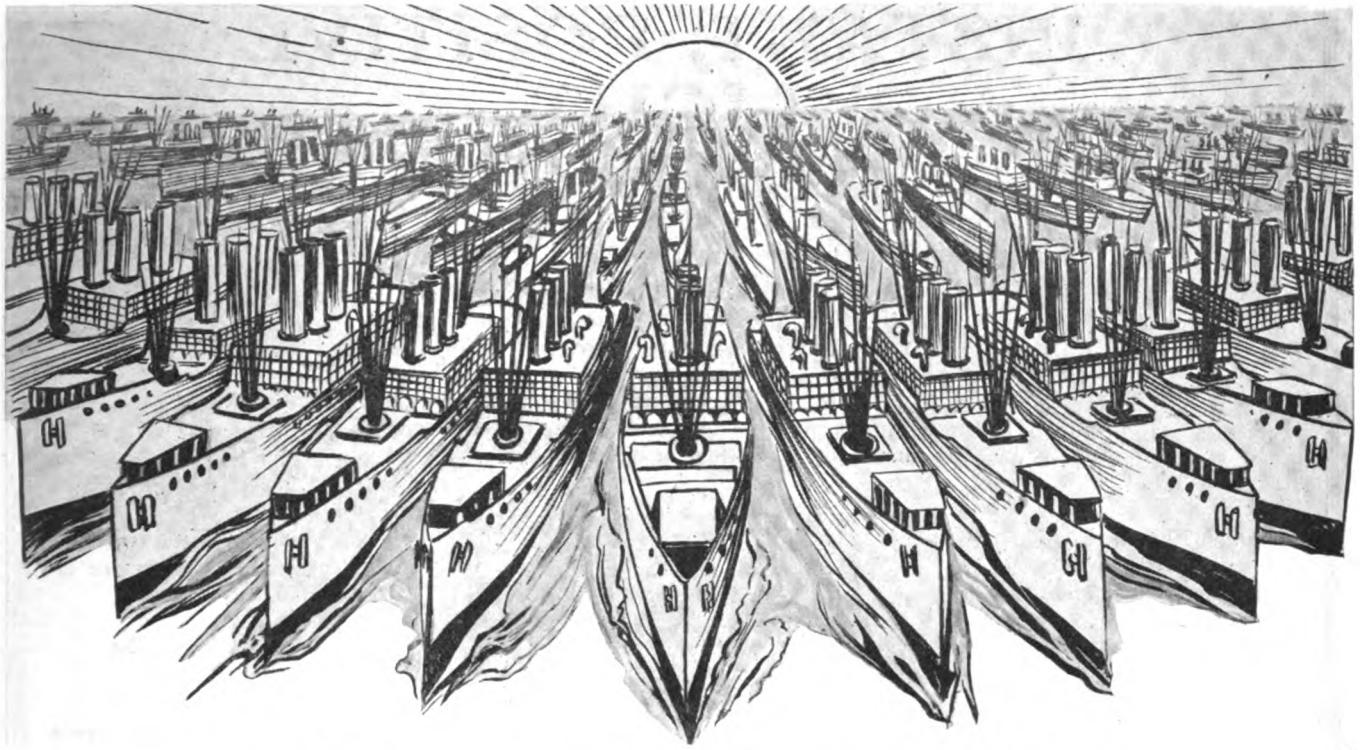

OVER 200 SHIPS

now have

LITOSILO DECKING

USED BY THE EMERGENCY FLEET CORPORATION

Approved by

AMERICAN BUREAU OF SHIPPING and LLOYDS

Service

600 sq. ft. of Litosilo was applied on the Steamer WAR HATHOR at Montreal within 48 hours from the time it was ordered at Philadelphia. Our contract organization is trained to meet unusual demands.

Litosilo Decking is an honest material, and is backed up by a live organization. It's the ideal material for service and speedy installation. Over 200 ships are now equipped with it, and nearly 300 more, being built in 14 yards, soon will be.

If you wish to know the physical properties and methods of application of the most practical decking obtainable, ask us to send you **"The Story of Litosilo."**

Use Madesco Bituminous Solution and Enamel as a coating in bunkers, bilges and on bulkheads and tank tops and wherever the best quality of material and conscientious application of same are required.

Speed

"Litosilo" can be applied four times faster than wood planking. Two men can lay 1000 sq. ft. a day, thereby expediting delivery of ships to owners.

MARINE DECKING & SUPPLY CO.

1011 CHESTNUT STREET **PHILADELPHIA, PA.**

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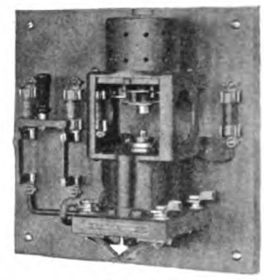
INSTANT, POSITIVE LIGHT CONTROL

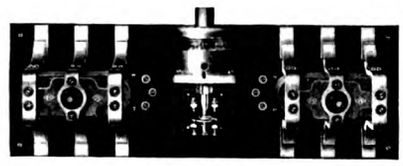
Type F
No. 790

Stand on the bridge and extinguish every light on the ship by simply pressing a button! That's why we build *"Diamond H"* Remote Control Switches —So the officer in charge—independent of any assistance—can instantly and positively put out whatever lights he wishes—effectively obscuring the ship in darkness. Just a push button mounted on the bridge or in the chart house operating the Remote Control Switch.



Type A
No. 605

Double Throw Combination for use where two sources of current are available. If one source fails, the load is automatically transferred to the other.



Back Connected Switches with Relay
Double Throw Combination

No Voltage release switches for use where the service is subject to interruption.

Illustrated price-list on application.

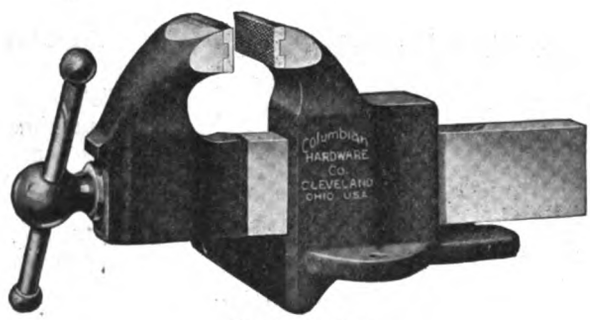
Guaranteed For Five Years

The Hart Manufacturing Co.

Hartford, Conn.

Guaranteed For Five Years

COLUMBIAN VISES AND ANVILS



Malleable Iron
Machinist Vise, Series 500

All Steel
One Piece Anvil

The Columbian Hardware Co.

Manufacturers **Cleveland, O.**

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PENBERTHY Regrinding Valve | PENBERTHY XL--96 Ejector | PENBERTHY Cellar Drainer | PENBERTHY Safeguard Water Gauge

TRADE PENBERTHY MARK.

A Remarkable 31-Year Record Behind Each Iniector—

Since 1886, when this company was established, the Penberthy Automatic Injector has stood for unique—almost startling—injector performance.

For thirty-one years the Penberthy has given the engineering profession an injector that would deliver water at from 160 deg. to 212 deg. F.—an injector that would handle sandy water without trouble and with very little wear. An injector that is certain of operation.

It is quite usual for a Penberthy injector to go a dozen or more years without requiring a cent's worth of repairs.

However, engineers planning to use an injector on the most severe or unusual service, where wear will naturally take place, should note carefully the following fact—for their benefit we have made all parts of Penberthy Injectors interchangeable and on account of our wide distribution and service policy, these parts may be obtained from almost every dealer **at very low cost.**

Penberthy success was not stumbled on. It resulted from hard work and the right kind of wisdom back in 1886. At this crucial time the Penberthy leaders adopted our fixed policy of high grade standardization. Only first grade metals have entered into Penberthy construction. We have costly analysis made to be sure of perfect uniformity of these—thus protecting every user and guaranteeing maximum service and resistance to wear.

We also have an experimental department which does nothing but solve the various new injector problems that come up. If you have any injector questions or puzzles, this department is at your service free of charge—simply send us complete details.

There is a great deal about injectors that doesn't appear on the surface. The Penberthy Catalog is a unique book because it gives the full "How and Why" of Injectors. You'll find a great deal of information not in the usual catalog. Send us your name and address now and we'll mail you a free copy of the latest edition.

PENBERTHY INJECTOR CO.

DETROIT Established 1886 MICHIGAN

Canadian Factory: Windsor, Ont.

New York Depot: 71 Beekman St.

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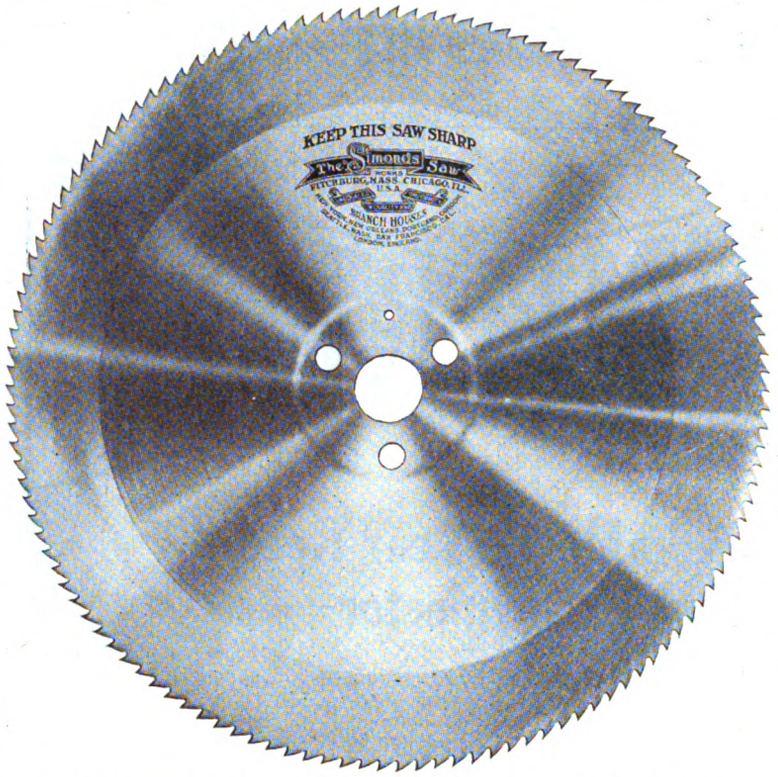


Metal Cutting Saws

Steel Shipbuilders will find SIMONDS Metal Cutting Saws, Solid Tooth or Inserted Tooth, or Hack Saw Blades most efficient and dependable.

Write for prices and particulars.

SIMONDS

Manufacturing Company

"The Saw Makers"

Established 1832

17th Street and Western Ave.
CHICAGO, ILL.
NEW YORK CITY
PORTLAND, ORE.
LOCKPORT, N. Y.

FITCHBURG, MASS.

NEW ORLEANS, LA.
SAN FRANCISCO, CAL.
VANCOUVER, B. C.

St. Remi St. and Acorn Ave.
MONTREAL, QUE.
MEMPHIS, TENN.
SEATTLE, WASH.
ST. JOHN, N. B.

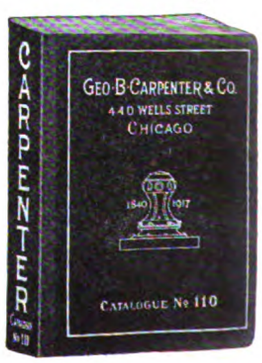
We Have The Goods!

We Are Not Desk Merchants

This company was founded in 1840—seventy-eight years ago. Our commercial experience has enabled us to perfect an organization for the assembly and sale of merchandise ranking with the highest in this country.

We have right now in our Chicago warehouses a stock of goods surprisingly complete, all things considered. The full list is described and illustrated in our two large catalogs, totaling over 1500 pages—most timely books for the man who does the buying. You can open the way to an additional storehouse, access to which may be the means of enabling you to keep your production up to schedule. Address Dept. 28.

Port Lights Bulkhead Lights Chocks
Bitts Cleats Chain Bolts Nuts Spikes
Washers Clinch Rings Rivets
Special Canvas Goods Air Hose



From Keel to Truck **GEO·B·CARPENTER & CO.** From Stem to Stern

336 North Wells Street **CHICAGO, ILLINOIS**

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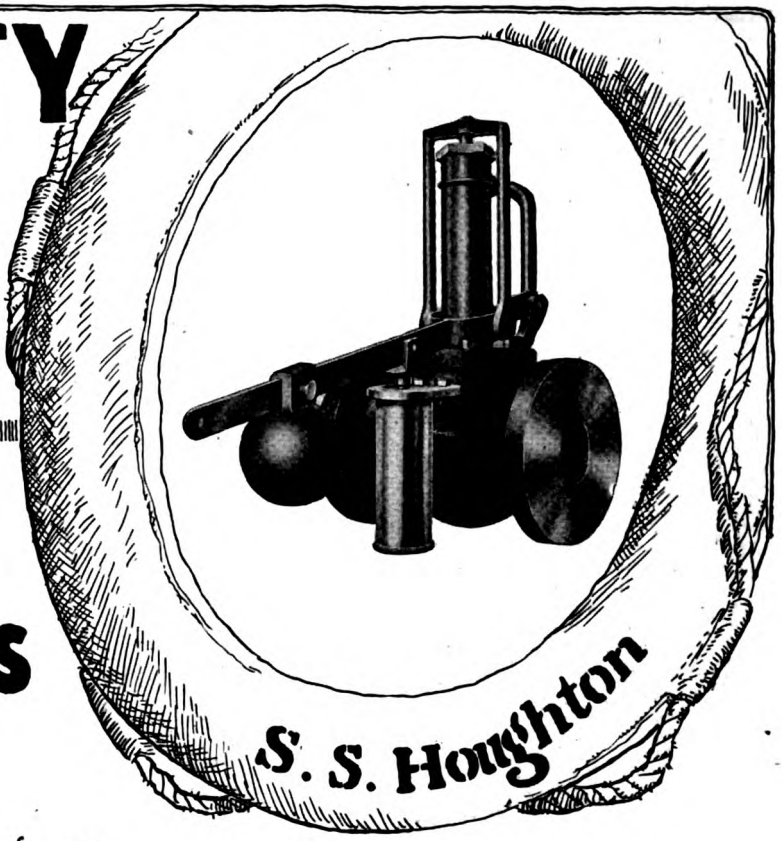
A NECESSITY ON EVERY SHIP — DAVIS REGULATORS



are necessary for the best operation of any fresh-water steamship.

Davis Pressure Regulators are being used on most of the big ships on the Great Lakes because for nearly half a century they have made good in Great Lakes service.

Davis Pressure Regulators reduce the initial boiler pressure to any desired delivery pressure. Their operation is controlled entirely by the delivery pressure and regulated by weights so that the operation is positive and can be depended on under all conditions. There are no diaphragms, no springs, no troublesome parts to require adjustment. They are so designed that the motion of the ship does not affect the valve action. The operation is visible and can easily be tested by hand.

Put Davis Regulators on your ship while she's laid up this winter, to save steam and save trouble next summer.

Davis Pressure Regulators are made in different sizes to fill every need on shipboard. Before you lay up for the winter, write for a copy of the Davis Catalog showing applications of Davis Pressure Regulators. Just address the G. M. Davis Regulator Co., 431 Milwaukee Ave., Chicago. Branches in principal cities.

DAVIS VALVE SPECIALTIES

STEAM SAVERS SINCE 1875

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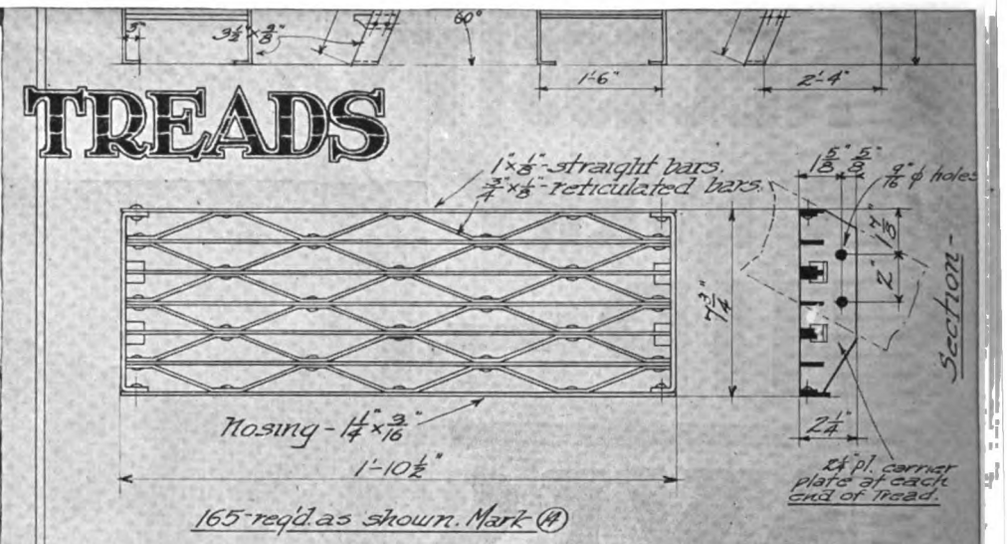
STAIR TREADS



IRVING-SUBWAY-GRATING
TRADE MARK
PATENTED NOV. 26, 1912

Stair Treads
15 Standard Sizes

No. 1.	Width, 5¼"	Length,	1-7"
" 2.	" 5¼"	"	1-10½"
" 3.	" 5¼"	"	2-2"
" 4.	" 5¼"	"	2-5½"
" 5.	" 5¼"	"	3-0½"
" 6.	" 7¾"	"	1-7"
" 7.	" 7¾"	"	1-10½"
" 8.	" 7¾"	"	2-2"
" 9.	" 7¾"	"	2-5½"
" 10.	" 7¾"	"	3-0½"
" 11.	" 10¼"	"	1-7"
" 12.	" 10¼"	"	1-10½"
" 13.	" 10¼"	"	2-2"
" 14.	" 10¼"	"	2-5½"
" 15.	" 10¼"	"	3-0½"

Special sizes to order

IRVING IRON WORKS CO.
Long Island City
New York

for
MARINE and
INDUSTRIAL purposes.

As used by the U.S. Navy and War Departments and the Emergency Fleet Corporation

Catalogue A1-0 describes the "reticulated" flooring for other purposes. Send for it.

NEW Cleveland POCKET-IN-HEAD Riveter

CLEVELAND RIVETING HAMMERS
FOR SHIP YARDS AND DOCKS

The New Cleveland is shorter, hits a harder blow and uses less air in operation than any Riveting Hammer on the market: 33⅓% gain in efficiency.

The new Cleveland is an "Ideal" Riveter for Ship Yards, Boiler Shops, Structural Work, Etc. The high speed and great power obtained through the Pocket-in-Head makes the New Cleveland a profitable investment. Capacity ¼-inch to 1½-inch Rivets.

CLEVELAND WOOD-BORING & STEEL DRILLING MACHINES
For Wood or Steel Cargo Ships

The No. 20W Wood-Boring Machine illustrated is well adapted for Ship Construction as it is "fast" and easily Handled by one man. Made in three Sizes, Nos. 10W, 20W and 30W, with boring Capacities ¼-in. to 4-in. in Wood. Shipped on Approval.

The No. 20TC steel drilling Machine is a light weight, high speed compound with a capacity of 1¼-in. boring and ⅞-in. Reaming in steel. It is a very compact, one man machine. We make 61 Types of Air Drills for all classes of work.

BOWES AIR HOSE COUPLINGS
OVER 1,500,000 IN GENERAL USE

Instantly connected or disconnected. Absolutely air tight

Interchangeable in all sizes most commonly used from ¼-in. to ¾-in.

Write for Bulletins Nos. 34, 37, 38, 39.

THE CLEVELAND PNEUMATIC TOOL COMPANY

NEW YORK PHILADELPHIA MAIN OFFICES AND WORKS, CLEVELAND, OHIO PITTSBURGH CHICAGO SAN FRANCISCO

CLEVELAND PNEUMATIC TOOL CO., OF CANADA, LTD., 84 Chestnut St., Toronto

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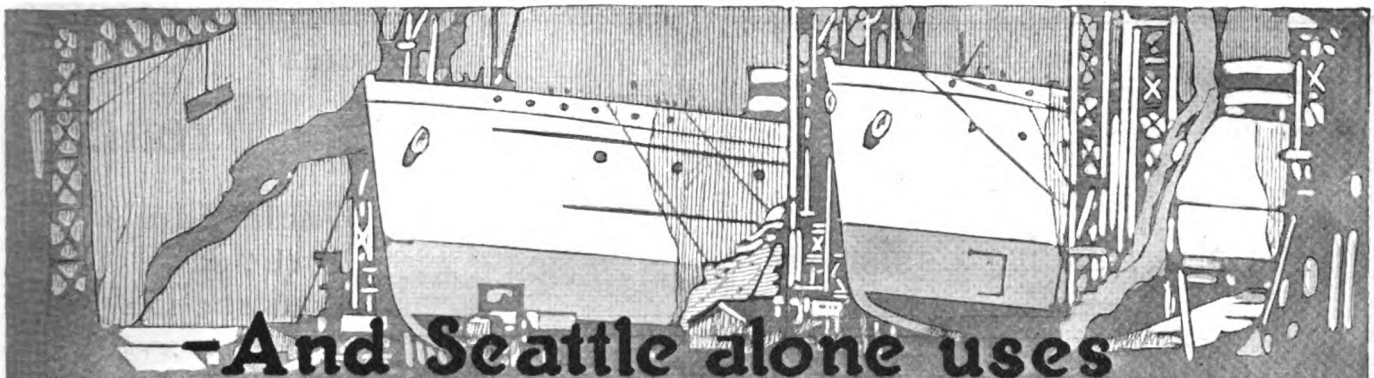

—And Seattle alone uses 636.300 feet of Diamond Hose—

IF you'll run your finger down the list of ship launchings you'll find that on a basis of ton per-calendar-day launchings the Pacific coast yards hold first, second, fourth, fifth, seventh, eighth, ninth, eleventh, twelfth and thirteenth positions.

It can be taken for granted that the Pacific coast yards are going to make a very determined effort to retain those ratings.

And if Seattle, the leader, using 636,000 feet of Diamond air drill and pneumatic tool hose, continues to re-order hundreds of thousands of more feet, there *must* be merit in the statement that for durability and all-round service there is *none better* than Diamond.

Diamond will gladly send a cross section for inspection.

The Diamond Rubber Co.
(Incorporated)
Factories, Akron, Ohio

CHARLES M. SCHWAB TELLS SEATTLE SHIPBUILDERS HISTORY WILL NEVER FORGET THEIR EFFORTS

Diamond HOSE

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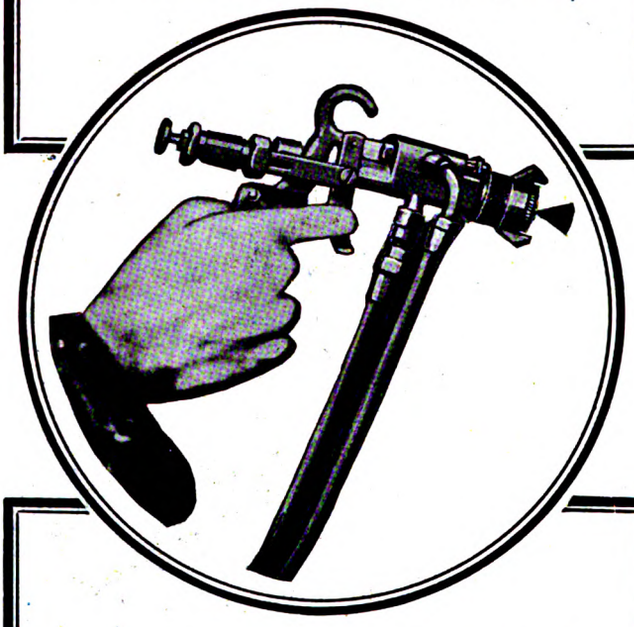
Spray-painting its ships with

Aeron System

Portable Painting Equipment



"MORE than pleased with QUALITY and QUANTITY of work; to say nothing of great amount of TIME SAVED in using this equipment" — says a leading shipbuilding company of the Southwest in reporting its success and savings in spray-painting ships with Aeron System Portable Painting Equipment.

All that this company is accomplishing with the Aeron is representative of what many other shipbuilders are doing. FURTHER, it is a significant example of the speed, economies and improvements you can bring to your painting operations, and of how you can meet the labor shortage condition.

Aeron System Operation Facts

One Aeron operator does the work of at least four or five fastest hand brushers.
A more even and thorough protective coating is applied, using the same paints that have always been used and without thinning them.
Dripping and other wastes are eliminated.
There are no brushes to wear out.
No time is lost in continual dipping from pail to the work.
Outfit is simple to operate, and can be easily moved any place.
The entire outfit is sold to you on a strictly guaranteed basis.

Right now when these economies and advantages count for so much, let us make a definite application of Aeron System possibilities to your individual painting problems or plans—ADDRESS—

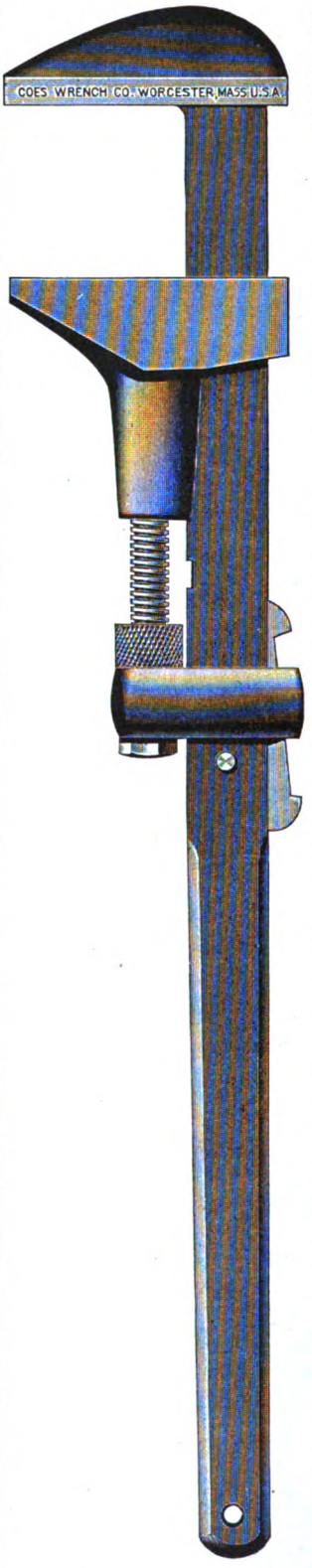
The DeVilbiss Mfg. Co.

1274 Dorr Street

TOLEDO - - OHIO

"GENUINE"

Coes TRADE-MARK KEY MODEL REG. U.S. PAT. OFF. Wrench



Uncle Sam's First Aid in Construction

Made in 28"-36"-48".

This wrench was designed to fill the gap between the *21-inch* and the heavy *spanner wrench* for large work. It will not *batter* and *jam* a large *nut* as will a *chain* wrench. It will not slip or make trouble and will take anything within its opening capacity, no matter whether square or hexagon.

Made of heavy steel *forgings*, fully hardened, and each wrench tested before shipping, to assure freedom from flaws.

In the Key wrench we have the finest *engine room tool* ever made. It is self contained.

The key cannot come off, and the two positions for *jaw straps* assure its going into corners without trouble.

The wrench is hardened by a special process, used by Mr. Coes for many years and this process, like all the other things about this line, is the result of long and earnest experiment.

Warranted free from mechanical defects. Patented and registered. Each wrench stamped with maker's name, etc.

28" opens 5⅛", weighs 19 lbs.
36" opens 6¼", weighs 28 lbs.
48" opens 9½", weighs 62 lbs.

Ask Your Jobber

Coes Wrench Company

WORCESTER, MASSACHUSETTS, U. S. A.

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CRANE

CRANE

Railroad

Brass to Iron Seat

Unions

Union Tees

Union Elbows

45° Union Elbows

Pump Stud Unions

Reducing Union Tees

MALLEABLE IRON
NON-CORROSIVE
NO GASKET REQUIRED
READILY TAKEN APART

No. 519
Female Ends

No. 590 Elbow
with Female Union

No. 591 Elbow
with Female Union

No. 594 Tee
with Female Union

No. 595
with Female Union

No. 598
with Female Union

No. 517 Reducing

No. 519½
Male and Female Ends

No. 592 Elbow
with Male Union

No. 593 Elbow
with Male Union

No. 596 Tee
with Male Union

No. 597
with Male Union

No. 598½
with Male Union

No. 517½ Straight

1855 — CRANE CO. — 1918

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Boston	Knoxville	Grand Rapids	Tacoma
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Works: Chicago and Bridgeport

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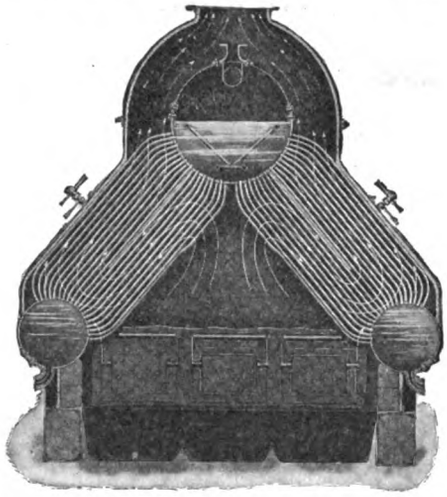
THE COLVEN MARINE BOILER

THE COLVEN
stands for
SAFETY



THE COLVEN
gives
EFFICIENCY

THE COLVEN
means
RELIABILITY

THE COLVEN
is
SIMPLICITY

THE COLVEN MARINE BOILER

is a highly specialized product, built only for marine work. No handholes and fitted joints to be kept tight. No flat surfaces to be stayed. The highest economy and steaming capacities within the smallest space and weight.

IF YOU HAVE A RUSH JOB WE CAN HELP YOU.
CONSULT US. Send for Booklets.

NEW YORK ENGINEERING COMPANY

2 RECTOR STREET NEW YORK

Morison Suspension Boiler Furnaces

For Land and Marine Boilers

Uniform Thickness, Easily Cleaned, Unexcelled for Strength

Also FOX CORRUGATED FURNACES

Manufactured by

THE CONTINENTAL IRON WORKS

West and Calyer Sts., BOROUGH OF BROOKLYN, N. Y.

ESTABLISHED 1859 Greenpoint Ferry from East 23rd Street, New York INCORPORATED 1887

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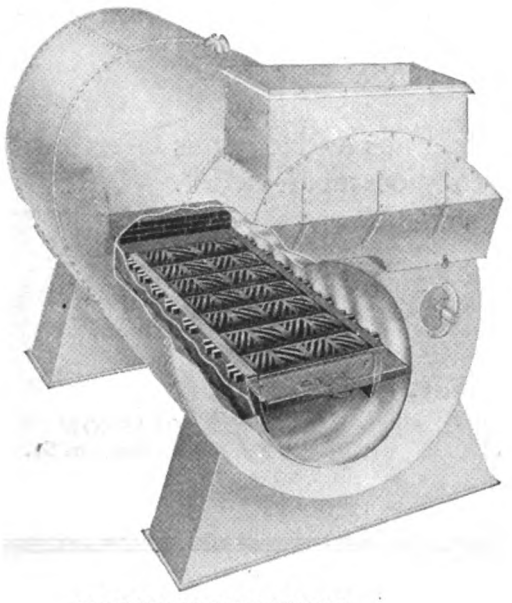
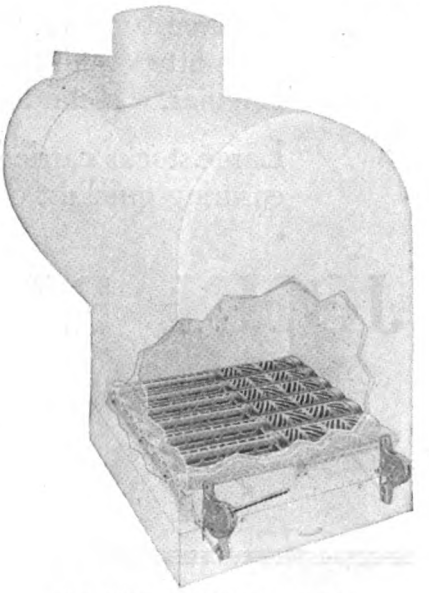
THOMAS ELLIPTIC GRATE BARS
FOR
STEAMSHIPS

Scotch Marine—Marine—Locomotive Fire Boxes and Furnaces

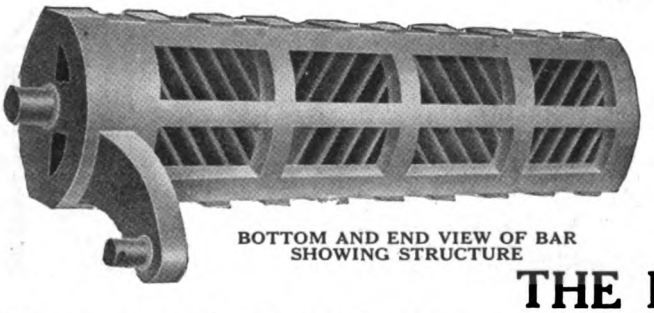


SCOTCH MARINE BOILERS



LOCOMOTIVE AND MARINE BOILER—Large

THOMAS WIGGLING—SHAKING—DUMPING GRATE BARS
PATENTED



BOTTOM AND END VIEW OF BAR SHOWING STRUCTURE

SIDE VIEW

THE BAR

That saves its cost in fuel saved in a few weeks use.
That eliminates the cleaning period.
That eliminates grate bar mishaps and shut downs.
That makes a poor steaming boiler, a free steamer.
That reduces the fireman's labors.
That cannot get out of fix and refuse to work.

THE WHY

STRUCTURE—Is made up of two curves, one top and one bottom, joined together at each side with spacing and connecting lugs of one-third contact and two-thirds air space, forming a structure in which the heat cannot equalize; the under portion can not get hot to break or become distorted and refuse to work.

MATERIAL—Made of pure Pig Iron (no scrap) bought on analysis, standing 2370 degrees before fusing.

OPERATION—The Elliptic shape, eccentric movement slips under the fuel or fire bed, peels the ash from its lodgment and deposits into ash pit and does not disturb the fire, tearing the fuel bed into streaks, seams, holes and pockets, as other shaker grates do.

RESULTS—The fire is kept at the highest state of efficiency at all times—never fouling, giving more steam and substantial savings in fuel.

For Use with Either Natural, Induced or Forced Draft
FOR DETAILED INFORMATION WRITE

THOMAS GRATE BAR CO.
Birmingham, Ala.

Branch Sales Offices:
901 Hippodrome Building, Cleveland, Ohio
518 Railway Exchange Building, Chicago, Illinois

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MARINE FORCED DRAFT

Designers of Complete Forced Draft Installations for Marine Work

Plans, Specifications and Estimates Furnished

Manufacturers of RELIANCE Standard Interchangeable Furnace Fronts for Coal and Oil Fuel. Low Speed Radial Fans fitted with RELIANCE enclosed Forced Lubricated Engines. Retarders and minor fittings in all branches.

Large stocks carried of Standard Fronts, Fans and Engines ensuring quickest deliveries for emergency or repair work.

JOHN REID & COMPANY

HEAD OFFICE:

Hudson Terminals, 30 Church Street, NEW YORK

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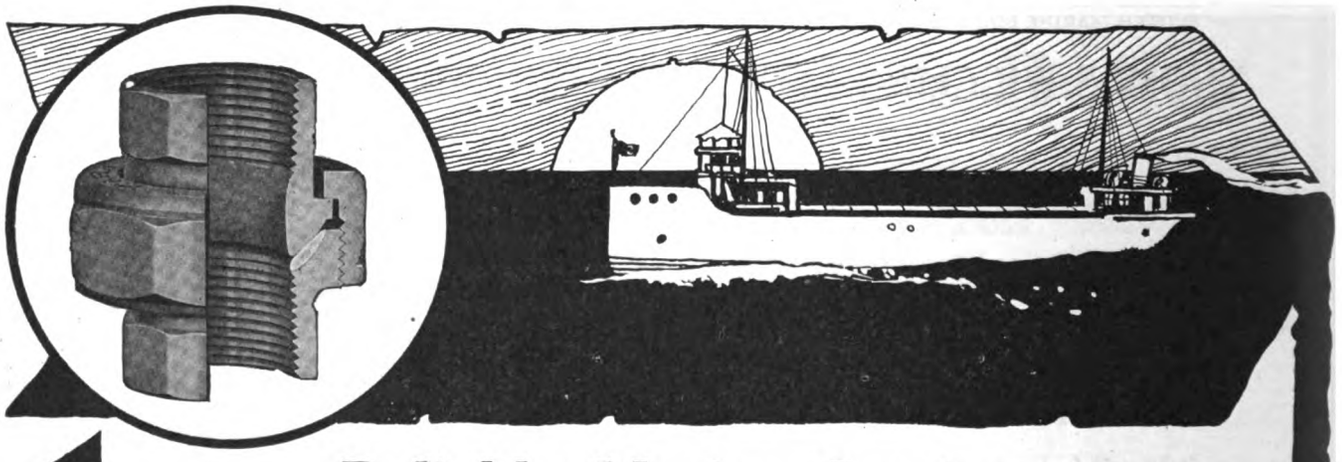
Board of Trade Bldg.

LONDON
4 Lloyds Ave., E. C.

GLASGOW
50 Wellington St.



Reliable Marine Service

With your vessel a thousand miles from the nearest hardware dealer, a broken union is a mighty serious matter. This situation will never arise if you use the ***Mark Union.*** The ***Mark Union*** insures tight joints.

The Mark Union is made from rolled steel which gives it great strength to withstand the unusual strains which occur on board ship. It expands and contracts in the same ratio as the steel pipe on which it is used, preventing thread leaks.

No Union is too good to use on Marine piping—always specify the "Mark."

MARK MANUFACTURING COMPANY

1901 DEMPSTER STREET — EVANSTON, ILL.

THE MARK Cold Drawn STEEL UNION

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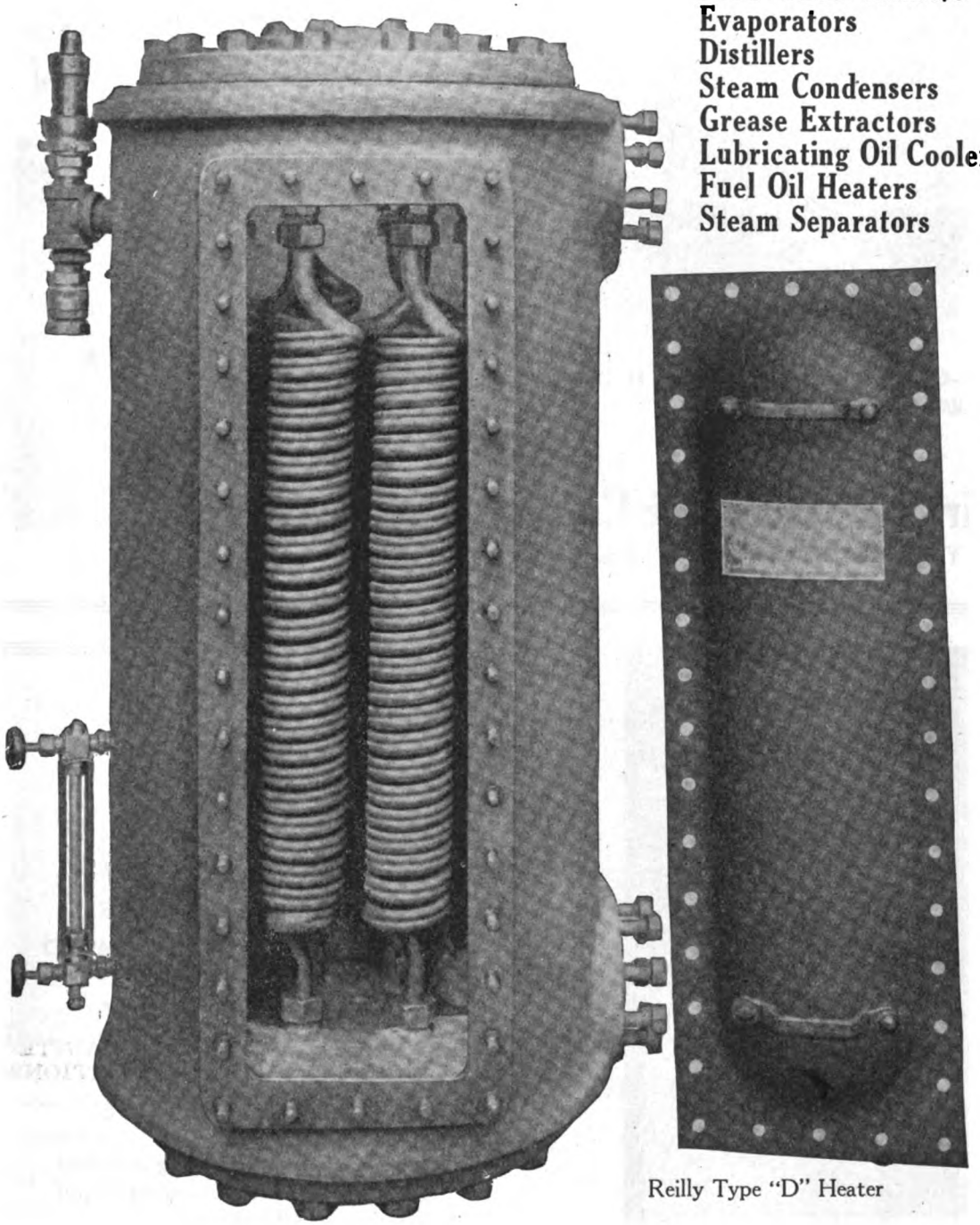
Reilly Marine Auxiliaries

Feed Water Heaters
Evaporators
Distillers
Steam Condensers
Grease Extractors
Lubricating Oil Coolers
Fuel Oil Heaters
Steam Separators



Reilly Type "D" Heater

THE GRISCOM-RUSSELL CO.

2121 West Street Building, NEW YORK

Chicago Office: 835-A Monadnock Building.

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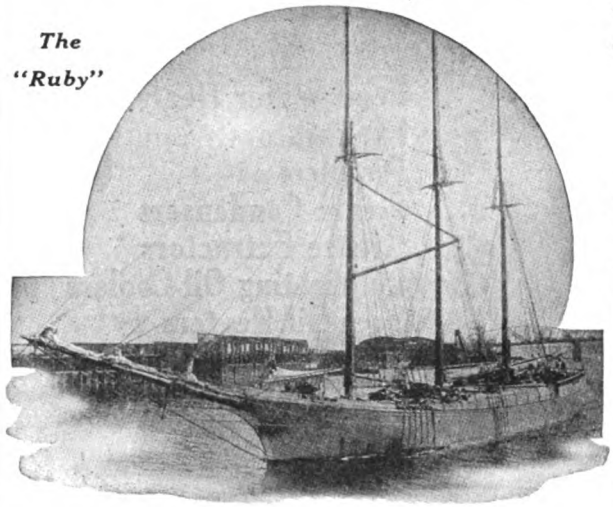
With This Heavy Deckload of Lumber

The "Ruby"



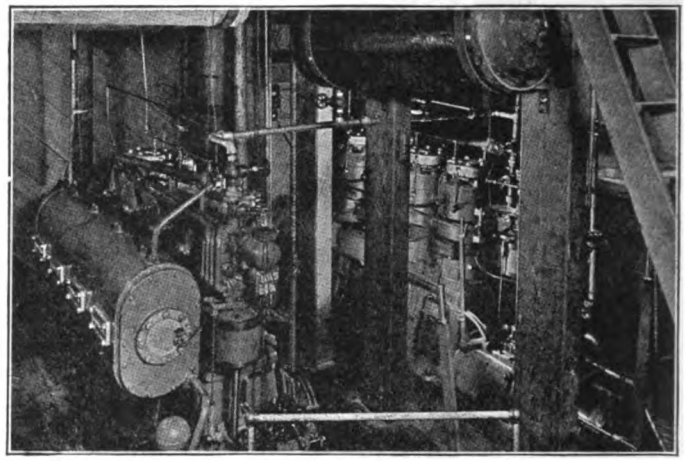
"C-O" engines—30 to 200 H. P. get unfailing flexible power from low priced fuel oils.

Fairbanks, Morse & Co.

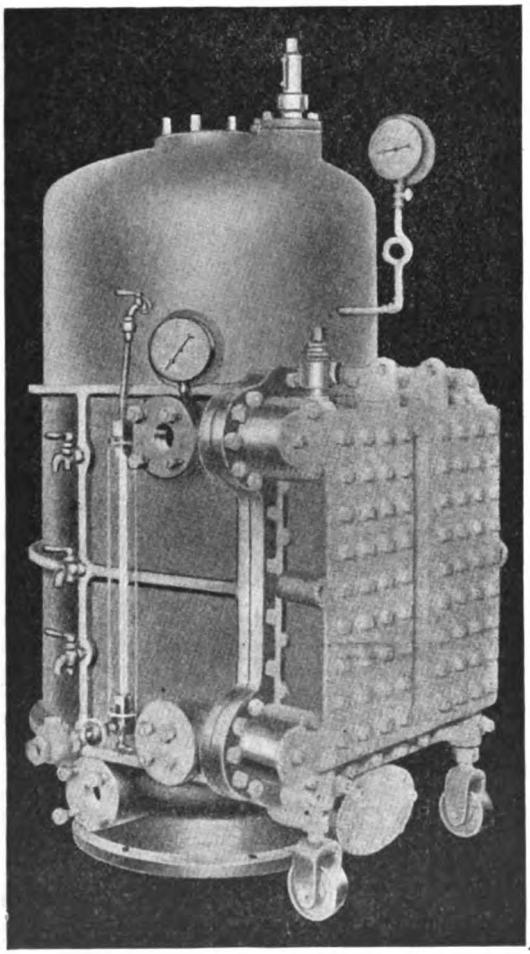
New York Baltimore Boston

The "Ruby" moves steadily up the channel—and slides smoothly into dock—under constant control of her two 100 H. P.

FAIRBANKS-MORSE "C-O" Marine OIL ENGINES



Two 100 H. P. "C-O" engines installed in the "Ruby"



EVAPORATORS AND DISTILLERS

ALL SIZES OF EQUIPMENT FOR THE ENTIRE MARINE FIELD

STANDARD DRINKING AND BOILER MAKE-UP PRODUCTION

EXTREME SIMPLICITY

RELIABILITY AND EASE OF MAINTENANCE UNDER ALL SEA CONDITIONS

NAVY SPECIFICATIONS

Our new apparatus is being installed on battleships, scout cruisers and destroyers at all navy yards

For full details and catalog address:

SCHUTTE & KOERTING COMPANY

Thompson and 12th St. PHILADELPHIA, PA.

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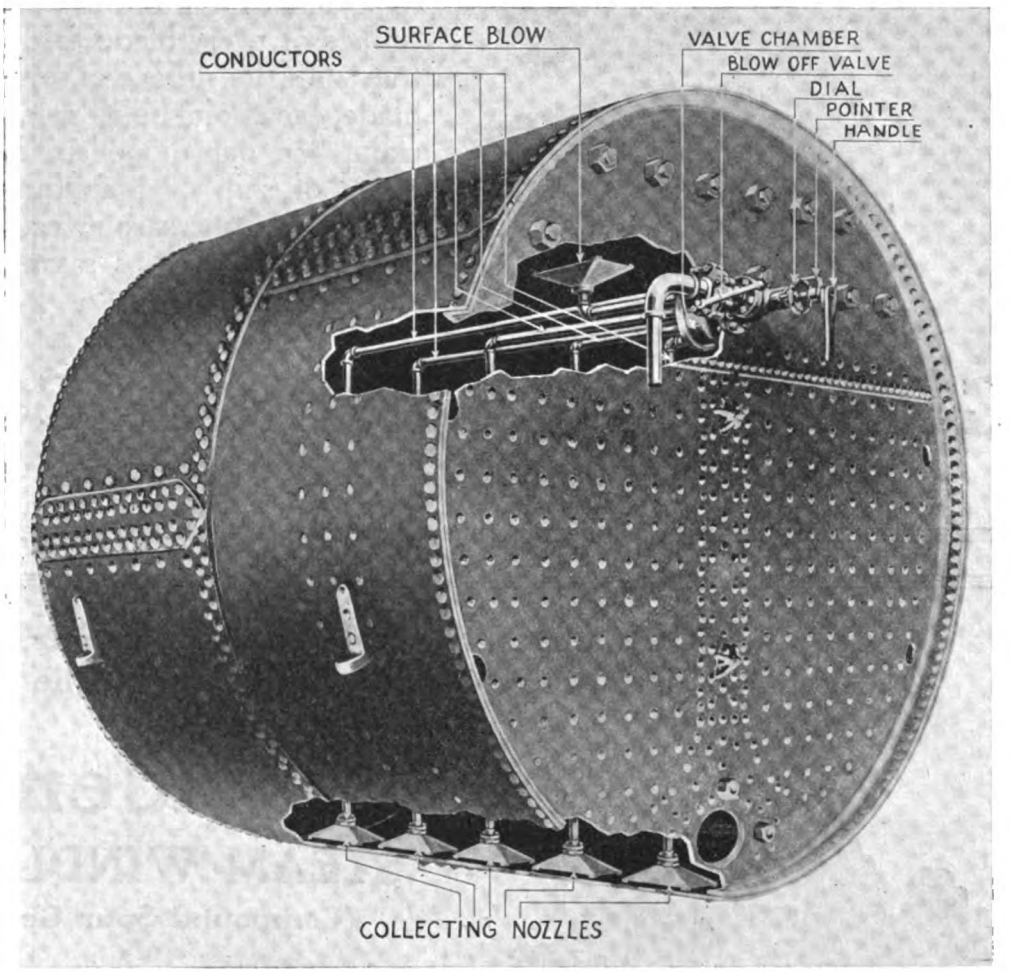
HERE IT IS!

The Geyser Boiler Cleaner

A practical Scotch boiler appliance of proven merit



The Geyser Boiler Cleaner attacks the scale problem from the right end by removing the cause.

It conserves the life of your boiler.

It eliminates most all repair expense.

It saves fuel.

It keeps your boiler in commission.

It maintains approximately normal temperature between the bottom and top of the boiler.

It occupies small space in the boiler.

The following are a few of the Steamship Lines that are now using the Geyser Boiler Cleaner:

Headwaters Steamship Co. **Merrimac Steamship Co.** **Franklin Steamship Co.** **Calcite Transportation Co.**
United Fuel & Supply Co. **Detroit, Belle Isle & Windsor Ferry Co.** **Detroit & Walkerville Ferry Co.**

Write to-day for price, details of installation, etc.

Manufactured by

GEYSER BOILER APPLIANCE CO.

661-663 Atwater Street **Detroit, Michigan**

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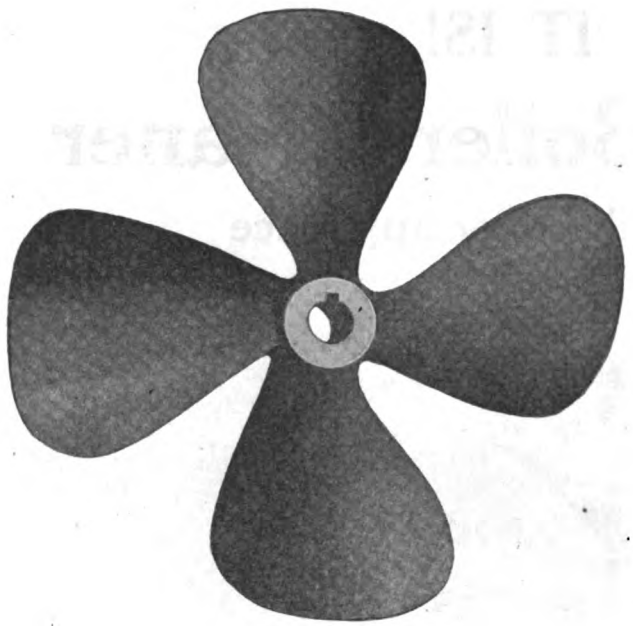


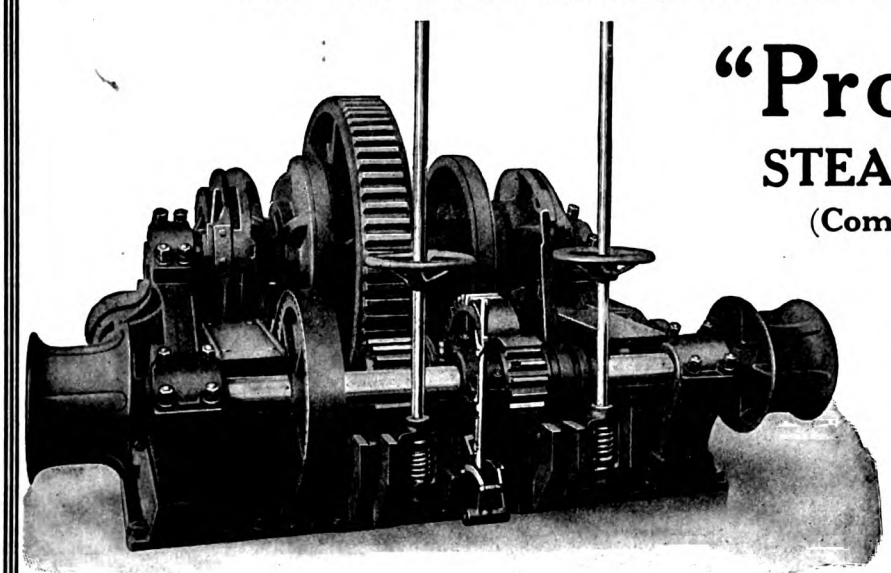
PERFECT PROPELLER WHEEL

Propeller is true in diameter, balance, pitch, angle of blade and surface. Every blade is located at exactly right angles with the next. The surface of every blade is absolutely true with the surface of every other blade, each point being parallel. We claim for our propellers increased speed of ship over anything made and resulted increase in economy of operation, as well as saving in machinery upkeep.

GEO. H. THACHER & CO.

Main Office and Works: ALBANY, N. Y.

"Having a PULL means having a friend in power who will act as a steam windlass for you." The



"Providence"

STEAM WINDLASS

(Compound Spur Gears)

has another kind of *pull*, and plenty of it. It has 15 per cent more *pull* than the worm-geared types and at 50 per cent faster speed. You have been looking for just this combination. Our price will please you, too.

Write us today.

AMERICAN ENGINEERING COMPANY

Successors to American Ship Windlass Co. and Williamson Bros. Co.

MACHINISTS AND FOUNDERS

PHILADELPHIA

15-312

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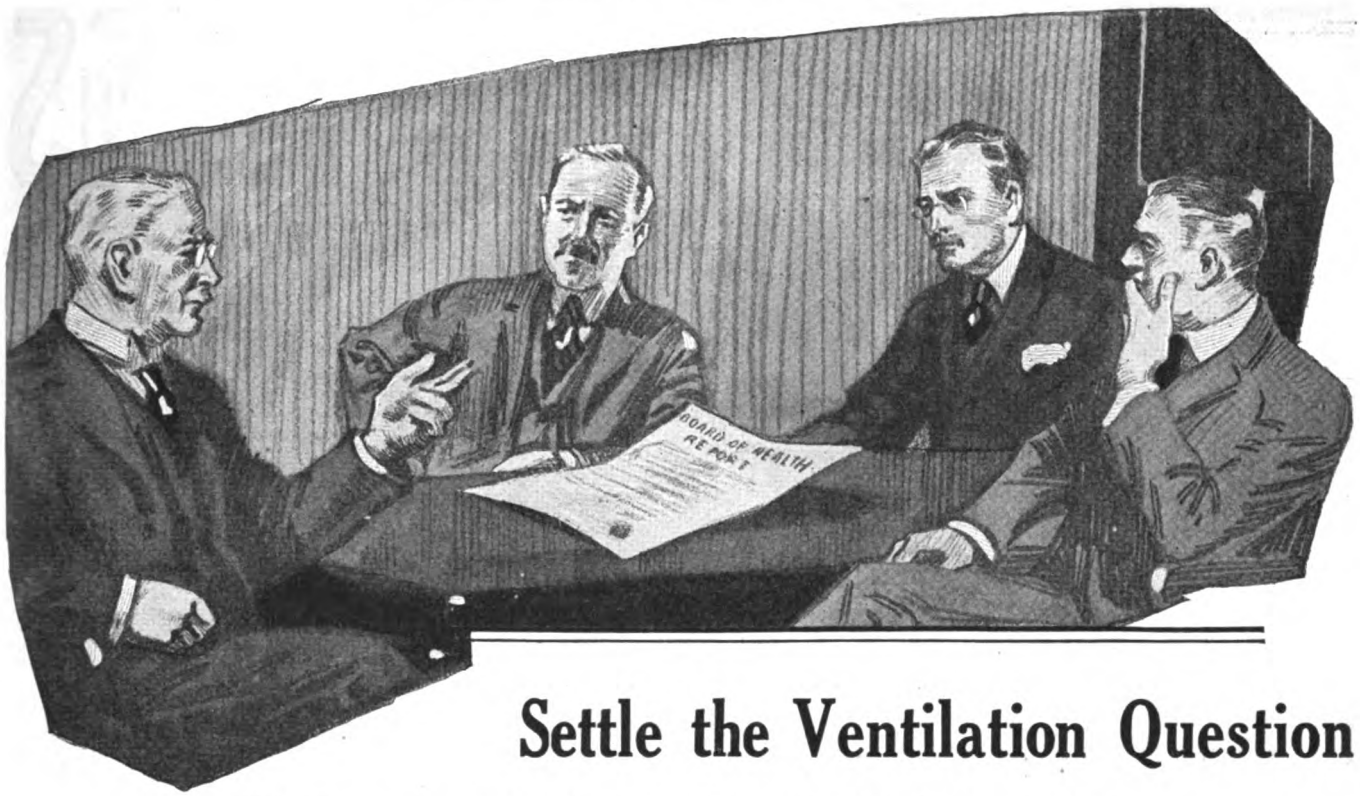

Settle the Ventilation Question

Whether it is realized or not, the right kind of ventilation on every ship is a big, important thing today.

You can settle the ventilation question quickly and surely by installing Sirocco equipment on your boats. Equipment carrying the A B C, or Sirocco mark is dependable, tested and tried by years of experience and use. A high degree of service and lasting satisfaction are the results.

We have equipped many of the most important ships in service; some of them with engines for generators, others with centrifugal condenser pumps, fans and blowers, or forced and induced draft fans or blowers. Wherever ventilation equipment is necessary we can give the quick, prompt, and satisfactory service needed today.

Let us send you detailed information applying especially to marine equipment.

AMERICAN BLOWER COMPANY

Detroit, Michigan

Canadian Sirocco Co.,
Windsor, Ont., Canada

Branches in all large cities

"Sirocco"

TRADE MARK

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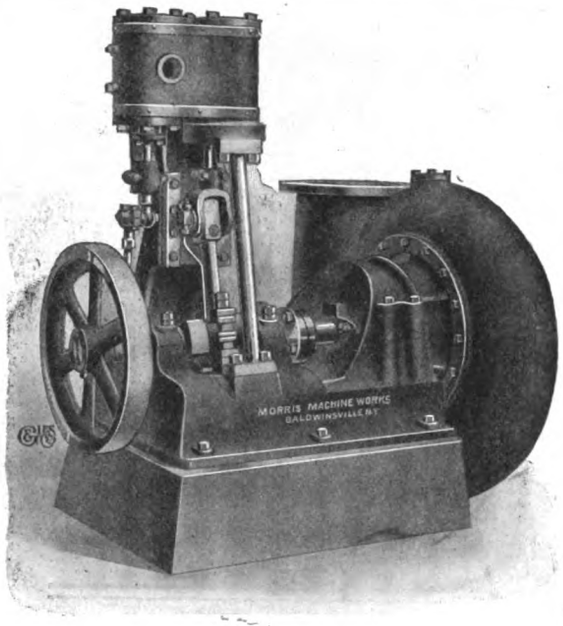

Low Operating Cost—

One of the many advantages of Morris Steam Driven Centrifugal Pumps is their extreme simplicity of construction.

This materially reduces the cost of operation as compared with plunger pumps.

MORRIS STEAM DRIVEN CENTRIFUGAL PUMPS

will greatly increase the efficiency of your power plant. They require minimum space and but little attention. They are unusually well adapted for pumping circulating water thru surface condensers.

Morris Centrifugal Pumps are built in all sizes for belt, direct connected, steam or electric drive.

Our Catalog of Morris Pumps describes fully our complete line of Centrifugal Pumps, Hydraulic Dredges and Steam Engines. *Write for it.*

Morris Machine Works
Baldwinsville, N. Y.

Branches in Principal Cities

GREETINGS

Greetings and sincere good wishes this Yuletide
May the coming twelve-month crown your every effort with success and may you enjoy the fruits of a Victorious Peace.

THE LUNKENHEIMER CO.
CINCINNATI

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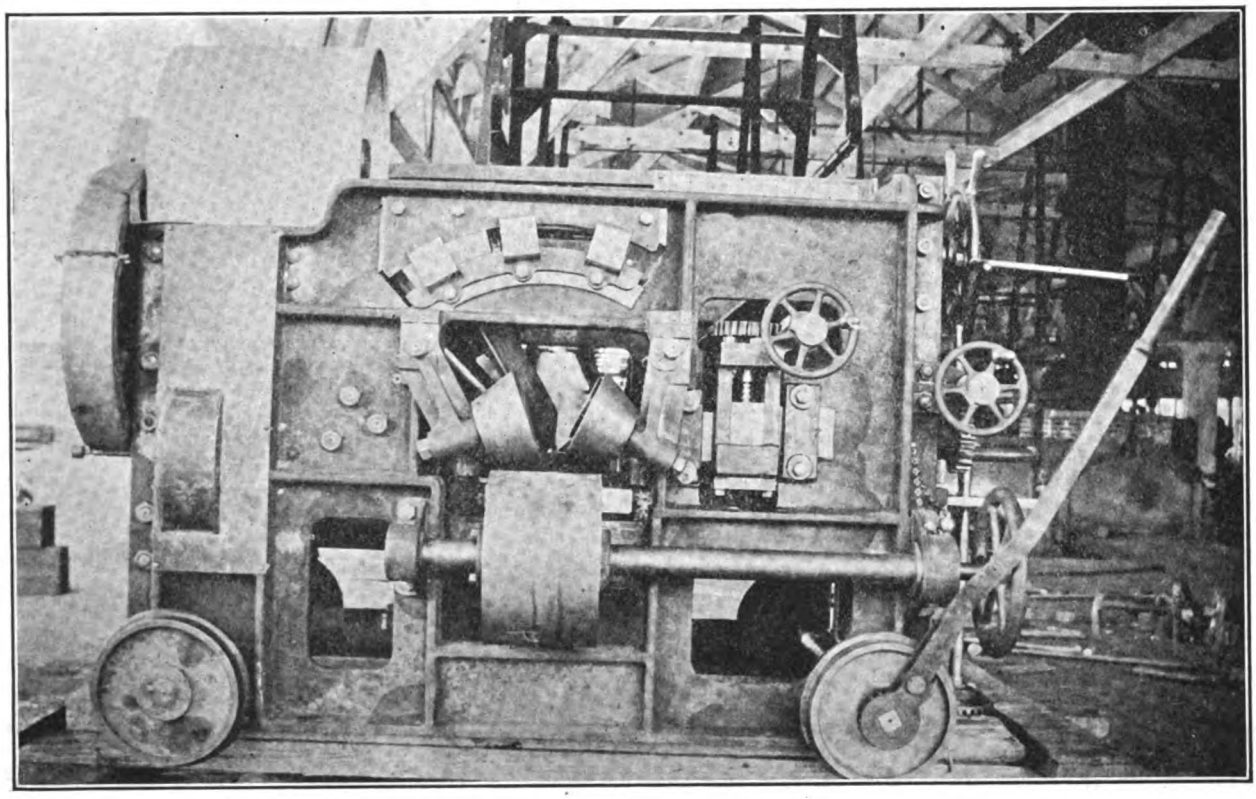
FOR SPEEDING UP SHIPBUILDING. A MACHINE YOU CANNOT AFFORD TO BE WITHOUT



Angle Bevelling Machine, Motor Driven

THE machine, as shown in above illustration, is without doubt one of the most needed machines in connection with steel shipbuilding. It will bevel angle iron, channels, etc., in a few minutes that would require hours in the old way, and will do a perfect job, which is impossible if done by hand. The old way of doing this work is not only extremely expensive, but very injurious to the material. We shall be pleased to send you list of satisfied users, also complete descriptive matter.

SHIPBUILDER'S MACHINERY COMPANY, Inc.

SEATTLE, WASHINGTON, U. S. A.

We also build S. & E. Plate Scarphing Machines, Liner Rolls, Portable Counter Sinking Machines, and Plate Tighteners.

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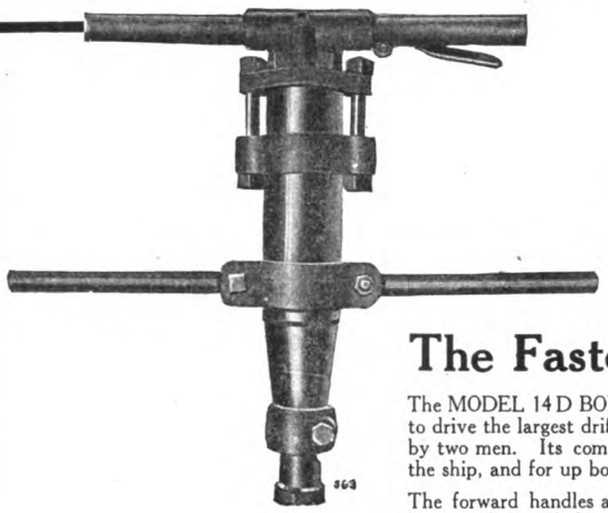
The Faster You Drive the Bolts



The Faster They'll Drive the Hun

The MODEL 14 D BOLT DRIVER will help you speed up. While powerful enough to drive the largest drifts in wooden ships, weighs but 68 lbs., and is easily handled by two men. Its comparatively slight recoil allows it to be used on staging around the ship, and for up bolts and tree nails on the bottom or sides.

The forward handles are adjustable, and it can be fitted with an air feed for driving horizontal or up bolts. Different snaps for large drifts, treenails and head bolts may be used with it. It stays on the job with a low upkeep cost.

THE Denver Rock Drill Manufacturing Co.

New York Houghton El Paso Seattle Butte DENVER, COLO. Joplin Salt Lake City San Francisco Los Angeles
CANADIAN ROCK DRILL CO., Ltd., Sole Agents Toronto Cobalt, Ont. Nelson, B. C. Vancouver

R-2

No. 3S "Little David" Chipping Hammer

No. 80 "Little David" Long Stroke Riveting Hammer

No. 2 "Little David" Non-Reversible Drill

No. 7 "Little David" Grinder

"LITTLE DAVID" PNEUMATIC TOOLS

You will find by actual test that "Little David" Pneumatic Tools will do the work for which they are designed just a bit better than others.

They have the necessary speed and more than that, the simplicity and sturdiness of design which enables them to stand up to the work. You will find in the lessened air consumption and lower maintenance cost the best of reasons for adopting them as standard.

Full information in the "Little David" Catalog.

INGERSOLL-RAND COMPANY

11 Broadway NEW YORK

165 Q. Victoria St. LONDON

Offices the World Over.

76-PT

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As We Produce

Many Forgings of Highest Quality

So Will We Produce

Many Fighting Ships of Highest Effectiveness.

United Forging Presses will produce the highest quality forgings in less time and at less cost than any other equipment. If you are considering the installation of competitive equipment, make a comparison on the basis of total press capacity sold.

We have sold to date Steam-Hydraulic Forging presses having a combined capacity of 136,000 tons.

WRITE FOR BULLETIN F

UNITED ENGINEERING & FOUNDRY CO.

PITTSBURGH, PA.

THE WORLD'S GREATEST MANUFACTURERS OF ROLLS AND ROLLING MILL MACHINERY

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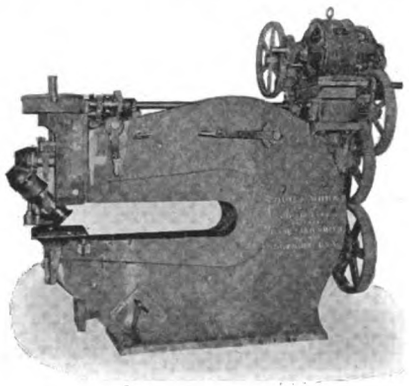
QUICKWORK
ROTARY SHEARS



Simplifies Shipbuilding

Cuts straight lines as well as curved and irregular lines. Also cuts opening in a sheet without cutting in from the side. In all cases the metal is left flat and smooth with square true edges. The cut is made at one passage of the metal through the machine.

Saves 50% to 90% in plate cutting

QUICKWORK ROTARY SHEARS have three changes of speed. Changes can be made instantaneously. Power driven and controlled throughout. All bearings bushed. All gears have cut teeth and the main casting is of semi-steel.

CUTS PLATE UP TO 1 INCH THICK

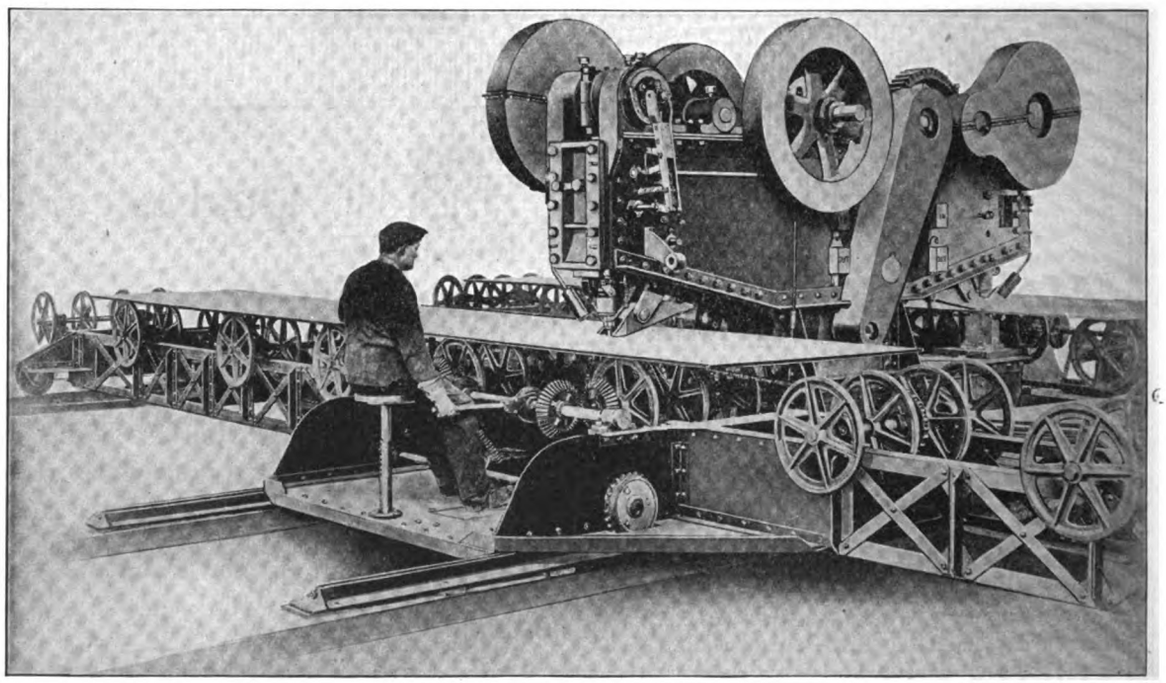
Send for Catalog

THE QUICKWORK COMPANY

ST. MARYS - - OHIO - . U. S. A.

NEW YORK OFFICE
No. 256 Broadway

PHILADELPHIA OFFICE
Bourse Building



THE LYSHOLM PATENTED PLATE PUNCH TABLE

Punching 4000 Holes Per Day In Steel Plates

Rapid production in punching holes in boiler plate is made possible on this machine by means of a roller table. Lateral and sidewise movements are under the lever control of the operator. ¶ The tables are built with roller bearings to facilitate rapid movement of the work. ¶ Plates up to 30 ft. x 8 ft. from ¼" to 1⅛" in thickness may be handled readily. ¶ Various shipyards and plate shops have reported records that average 4000 holes per nine-hour day. 6700 holes in a nine-hour day is a common occurrence. Full information on request.

Manufactured by **The Norbom Engineering Co., Denckla Bldg., Philadelphia Pa.**

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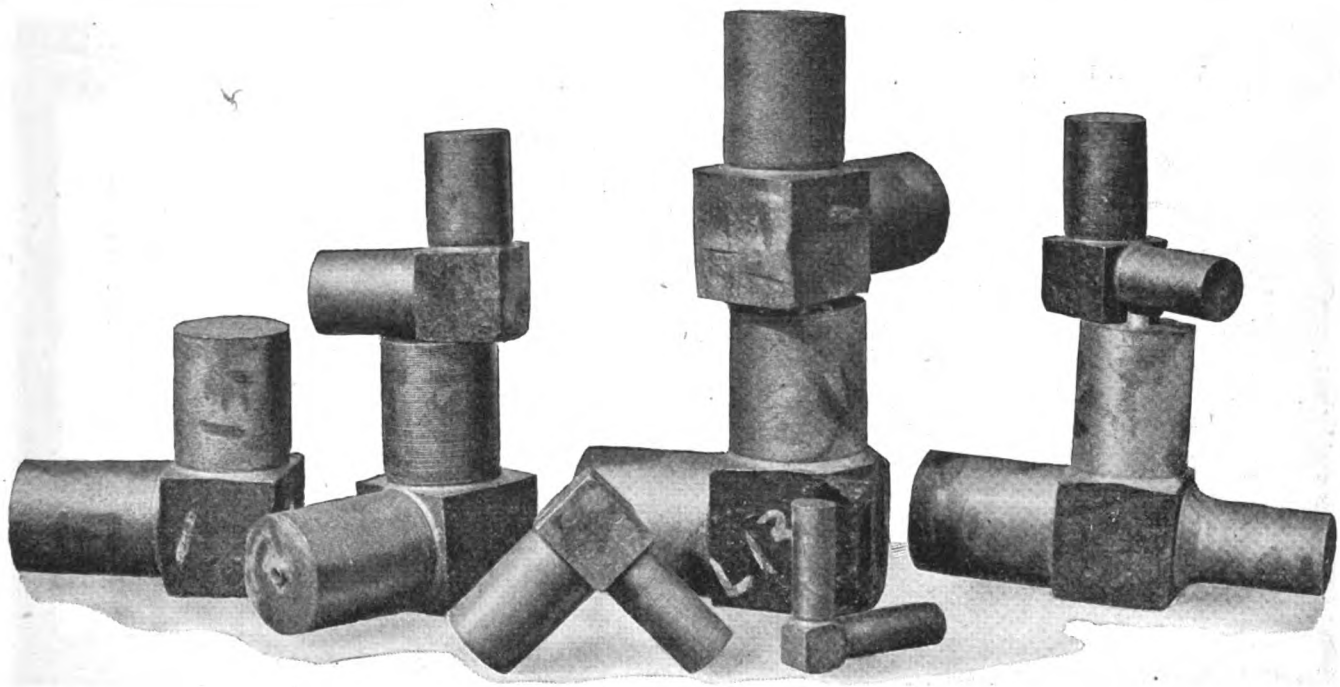
CAMDEN



THE GREATEST QUESTION

which some of us have to decide is where to get forgings.

Let these words,

CAMDEN FORGINGS

be a lamp by which to guide your steps, and if you should want hydraulic fittings, similar to the above, or marine engine forgings, or in fact any forging weighing from 25 pounds to 80,000 pounds,

LET US KNOW

CAMDEN FORGE CO.
CAMDEN, N.J., U.S.A.

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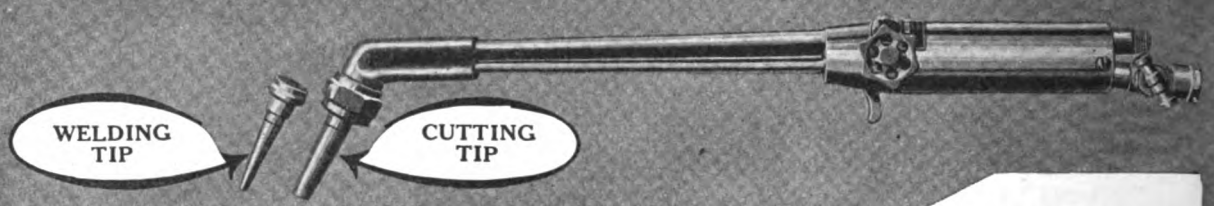
THE MILBURN



CUT-WELD TORCH

A Combination Oxy-acetylene torch with tips for Cutting and tips for Welding.

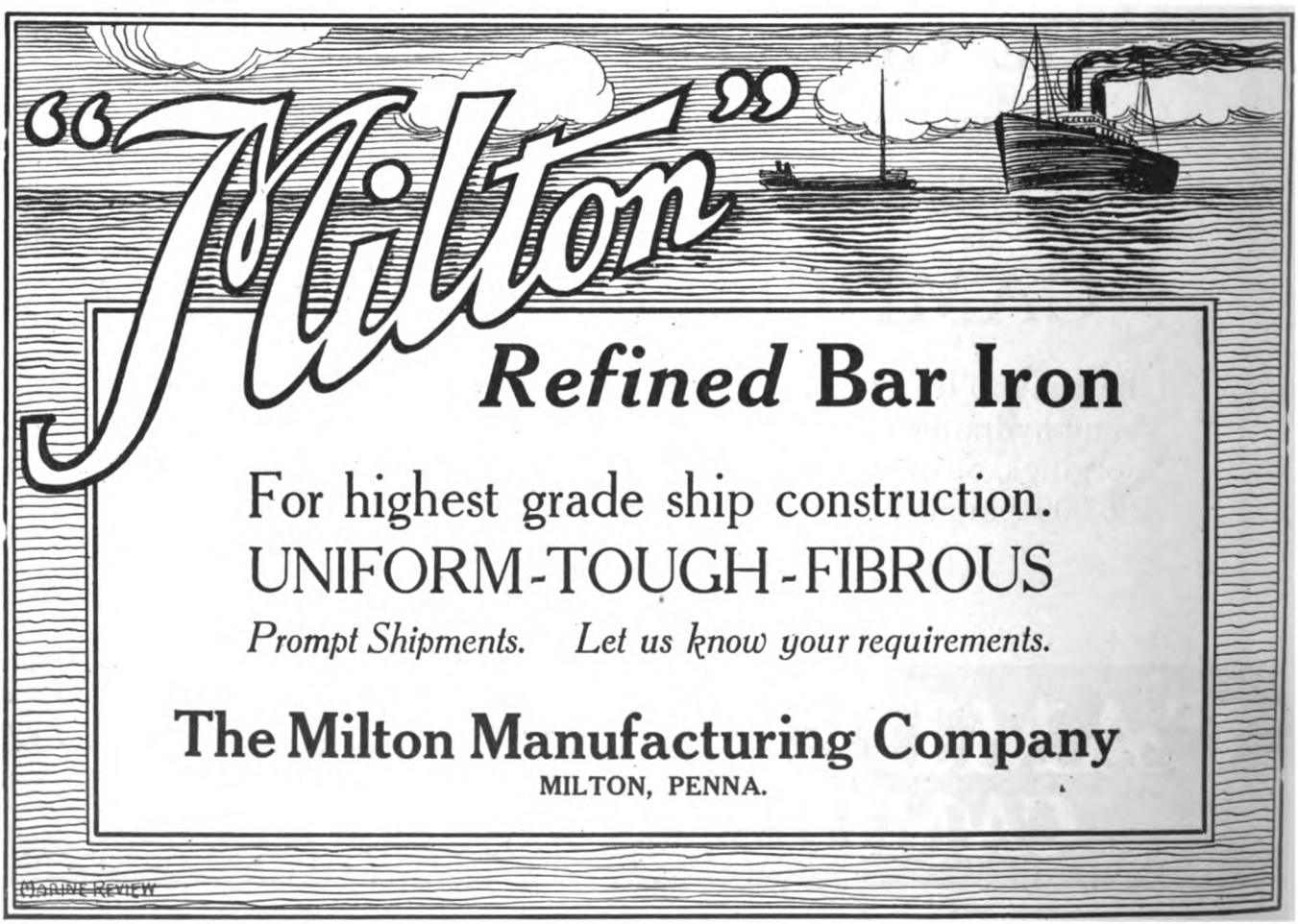
An all-purpose Torch adapted to any acetylene gas, giving a uniform flame with absolutely ***no flash-back.*** The valves are extremely simple and get-at-able.

This is unquestionably the sturdiest torch made. It saves the cost of an extra Torch—and works exceptionally well at either welding or cutting.

STOCKED EVERYWHERE

Sent on Trial. Or, write for Bulletin, 331

The Alexander Milburn Co., Baltimore, U.S.A.



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Heppenstall Forge & Knife Co.

Pittsburgh, Pennsylvania

REGISTERED H TRADE MARK

FORGINGS

REGISTERED H TRADE MARK

For

TURBINES AND SHIPS

Made of

Electric and Acid Steel

HEAT TREATED

Die Blocks Shear Knives

HEPPENSTALL FORGE COMPANY

BRIDGEPORT, CONNECTICUT

DISTRICT OFFICES:

Boston, 200 Devonshire St. — New York, 30 Church St. — Philadelphia, 617 Bourse Bldg. — Cleveland, 874 Rockefeller Bldg.

Detroit, 1703 Dime Bank Bldg. — Chicago, 722 Monadnock Blk. — Milwaukee, 501 First National Bank Bldg.

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Shipbuilding Begins

With peace a known factor of immediate importance, shipbuilders and manufacturers of marine equipment are perhaps asking themselves "Where do we get off"?

They stay right on—Mr. Hurley says so. Here it is:

> "We are only now beginning our program of ship construction. The removal of the emergency can not and will not bring an end to the world's need for ships, nor prevent us from carrying out our program to a successful conclusion. We shall continue to use all the facilities of shipbuilding that business economy will permit. I mean by that that all shipbuilders who live up to the expectations placed in them by the government will be expected to continue to build ships. They will be encouraged to do so. There will be plenty of work for every efficient yard. On the other hand, the government expects to supply the materials and direct the vast energies now devoted to shipbuilding. The end of the war will mean only the removal of the menace which confronted the world's shipping; it will not and can not mean the immediate elimination of the need for ships".

THE MARINE REVIEW will carry your message to the responsible man with buying power every where in this field—Atlantic and Pacific Coasts, Gulf and Great Lakes.

Now is the time for redoubled efforts for marine business.

THE MARINE REVIEW

Published Monthly by

THE PENTON PUBLISHING COMPANY

Penton Building, Cleveland

Power Boating :: ***The Marine Review*** :: ***The Iron Trade Review***
The Foundry :: ***The Daily Iron Trade and Metal Market Report***

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Orders for Ship Steel

WHEN the construction of the Emergency Fleet was begun, this Company called the attention of the men engaged in ship building to the importance of following certain suggestions in connection with the ordering of steel as given in the pamphlet — Structural Steel for Ships — recommended by the American Steel makers and adopted by the Emergency Fleet Corporation.

Many of the suggestions have been well followed by many ship builders and thus to that extent the delivery of steel to them has been expedited.

There are, however, certain of those suggestions, as well as some later mentioned in Carnegie Steel Company's advertisements in Marine Review, the importance of which is overlooked by some fabricators and the non-observance of which is retarding the placing of their orders in the mill and in consequence the delivery of steel to them. Two points in particular are those of Shipping Notices and Invoices.

As mentioned in a previous advertisement the two should not be confused.

A **Shipping Notice** is a list of material shipped and contains sufficient information for ship builders or their representatives at the steel mills to check the items shipped.

An **Invoice** contains all that is on the Shipping Notice, but in addition gives the prices of the items and concerns only those interested in price features.

In further consideration of these two items it should be carefully noted that much time is lost by not specifying definitely at the beginning, how many copies of each are required and to whom they should be sent.

Every change, after the order leaves the order clerk's office, delays its execution. The order clerk should cover these points very completely so that when the order reaches the steel makers there shall be no more changes.

Another point—there seems to be an impression among some fabricators that in order to live up to Lloyd's Rules the thickness of a plate must be given in decimals of an inch.

This is not necessary; in fact, it should be avoided. In other words, **plates should be ordered to the nearest sixteenth-inch thickness or to approximate weight per foot corresponding to such thickness.** Thicknesses in thirty-second inches or weight equivalent, while permitted, are to be avoided wherever possible, as set forth in—Structural Steel for Ships.

Strict adherence to the above recommendations will help all concerned—that is, the steel makers and the fabricators, and above all, the Emergency Fleet Corporation, and wherever in the pamphlet the words — absolutely necessary — are used or implied, they should be strictly construed.

Carnegie Steel Company

General Offices: Pittsburgh, Pa.

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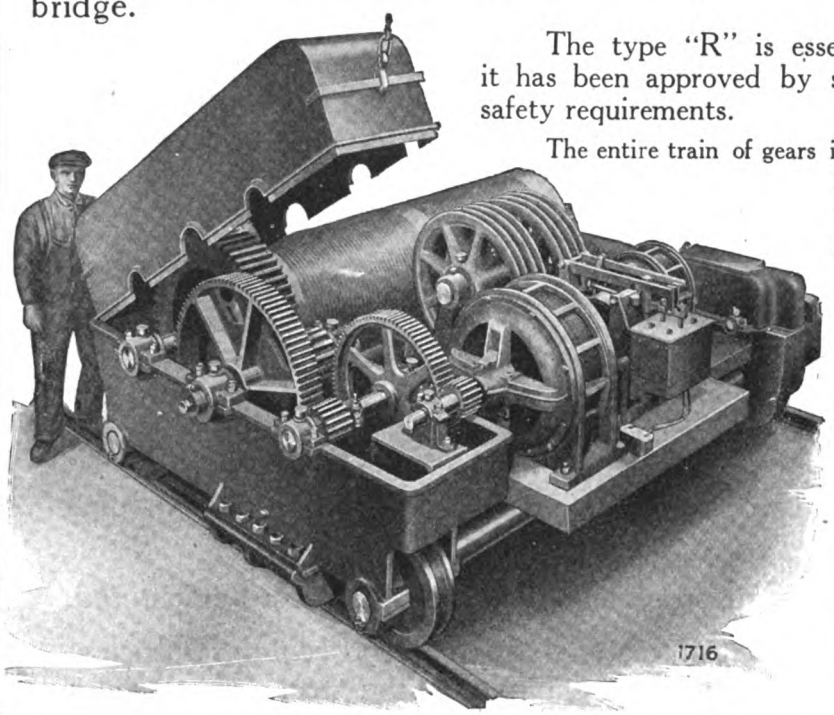
The Whiting Type "R" Crane Trolley

shown below was furnished the Seaboard Air Line Ry. for their Portsmouth, Va. shops for handling locomotives, two 80-ton trolleys operating on an 86 ft. span bridge.



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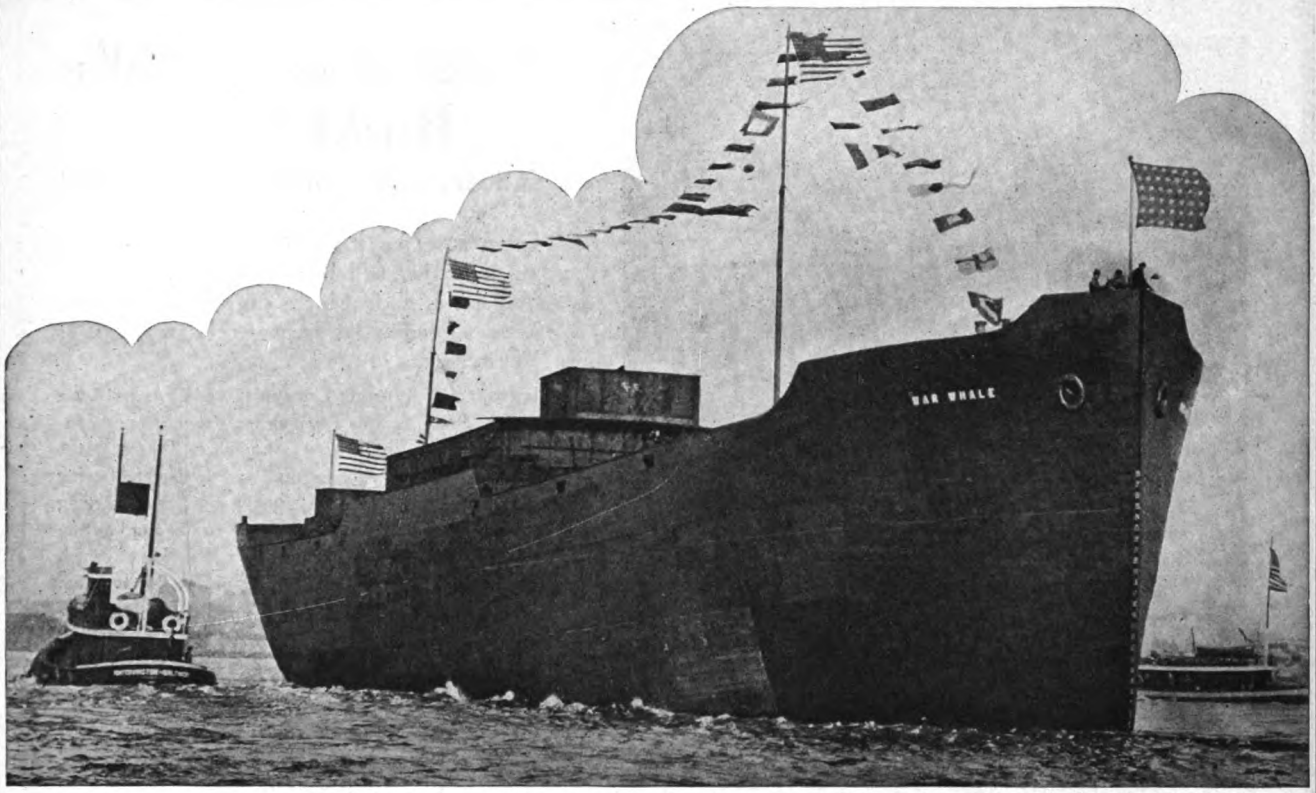

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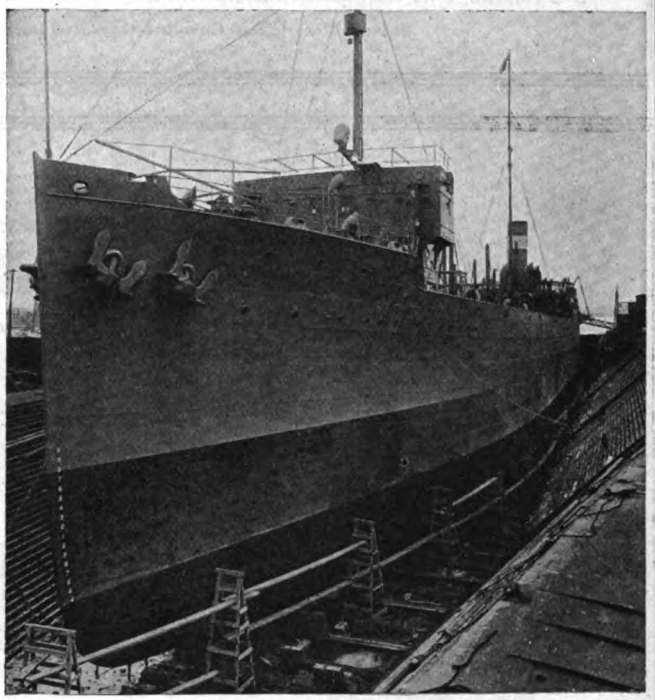

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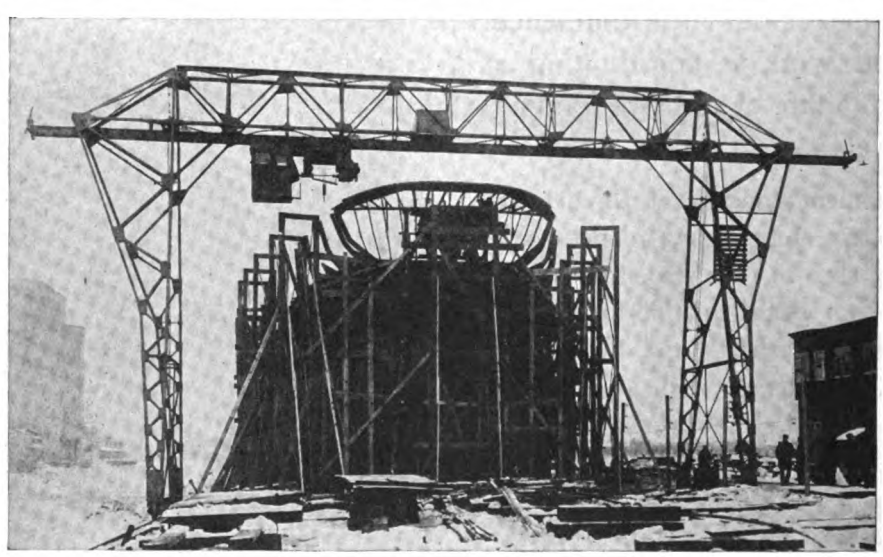

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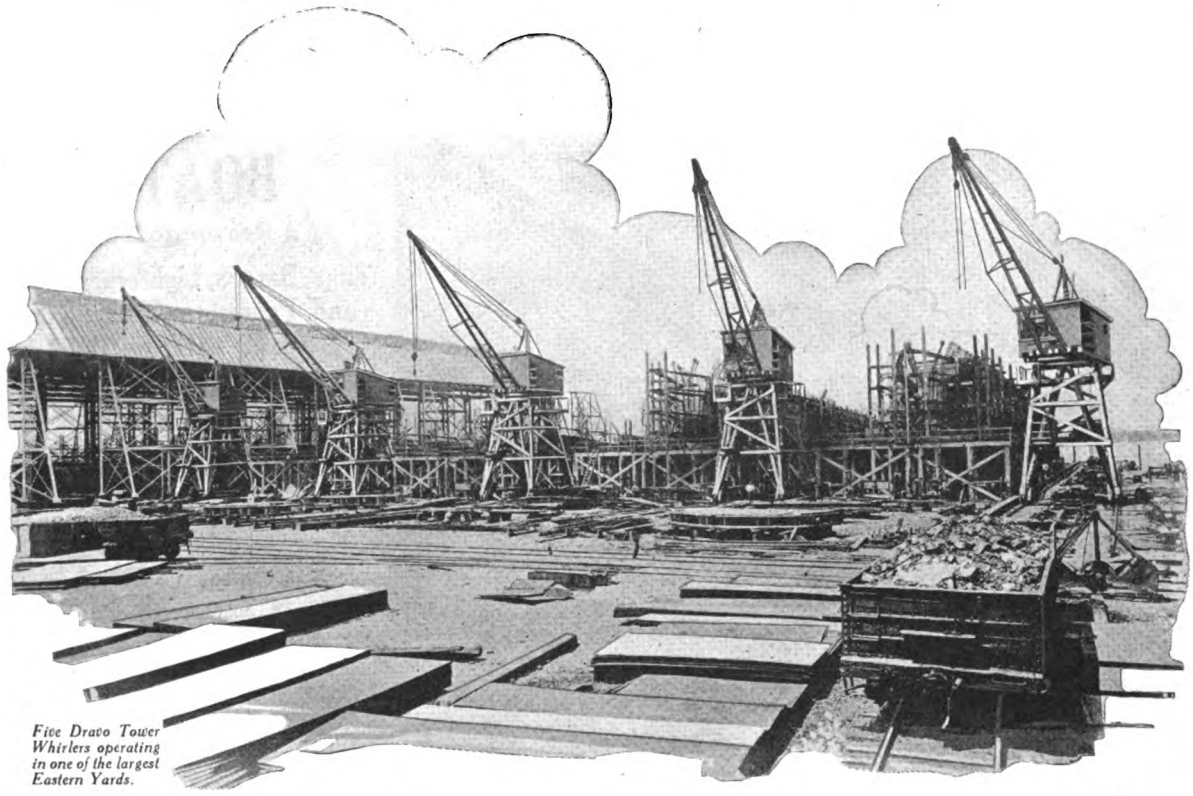

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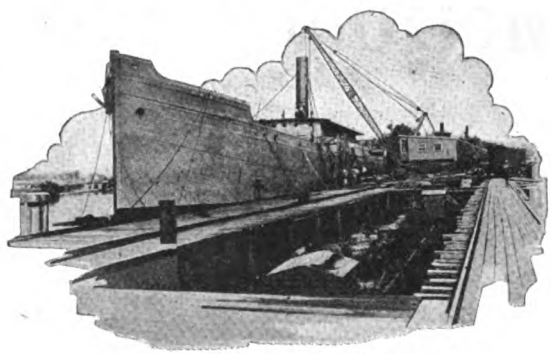

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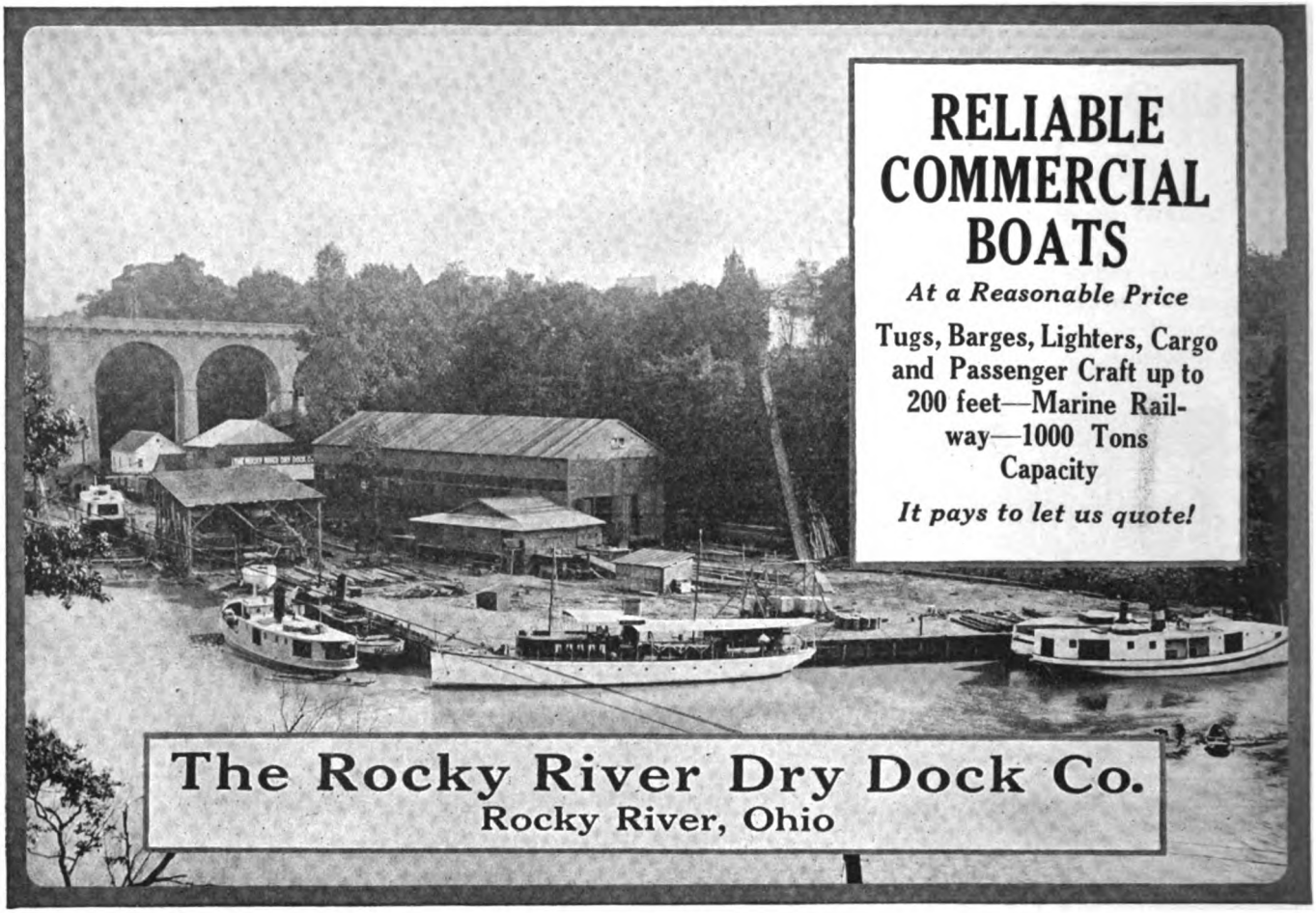
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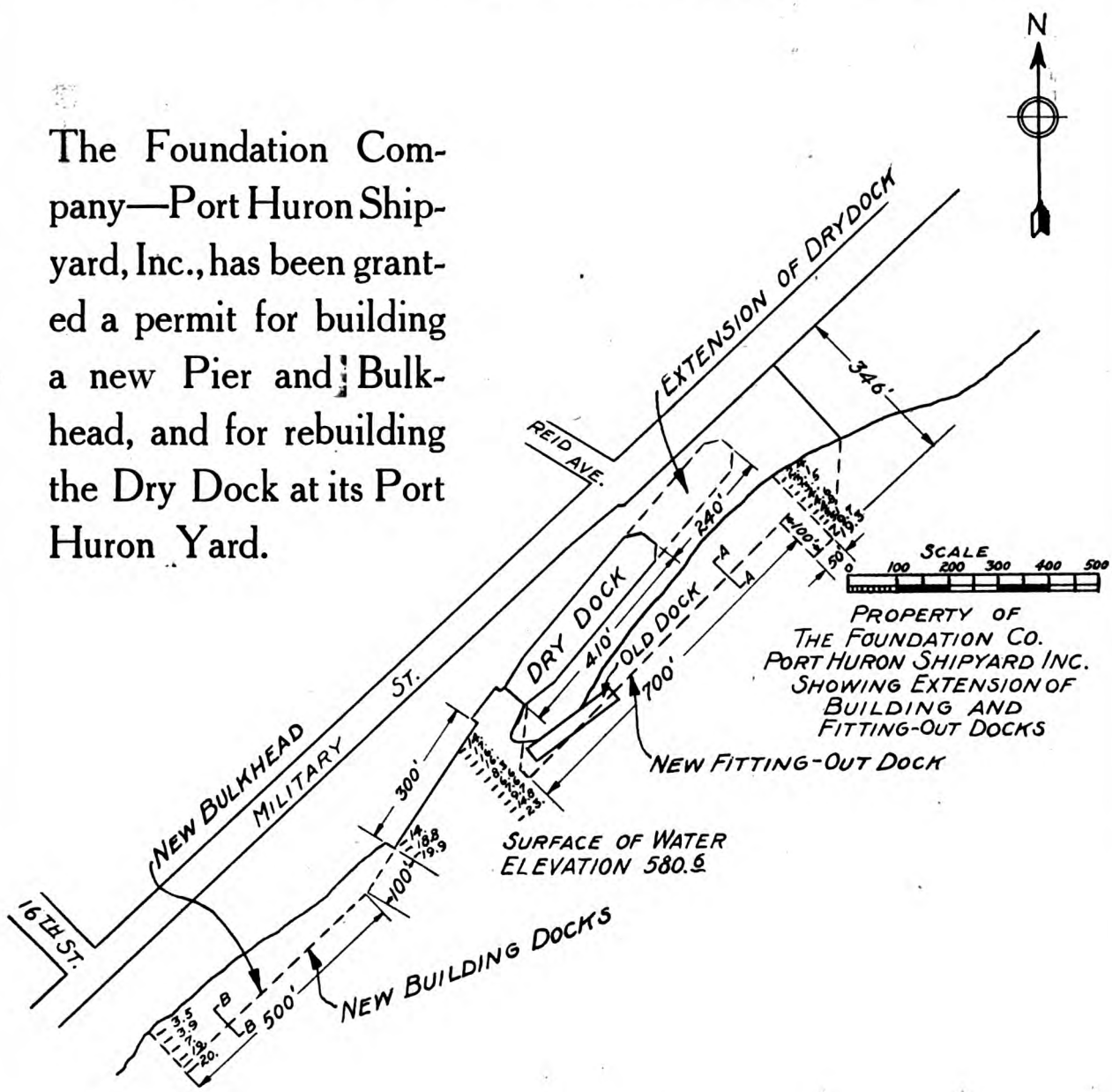

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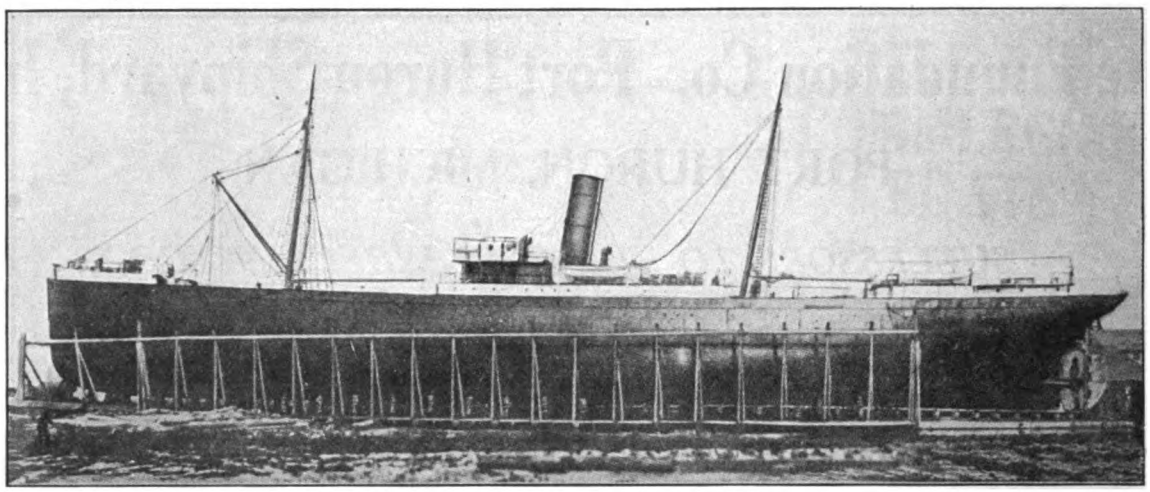

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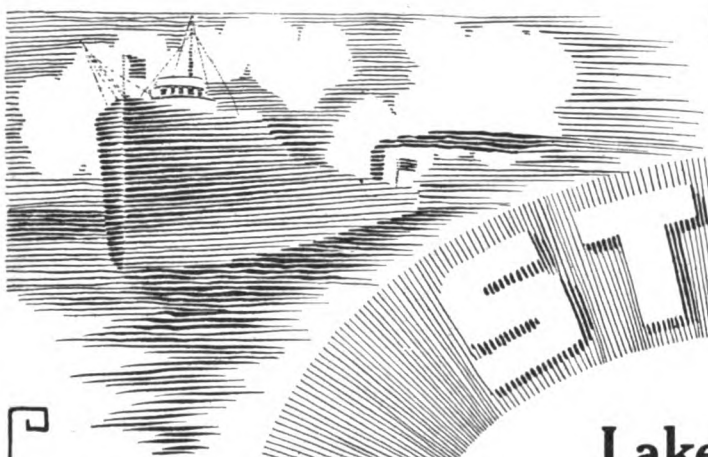

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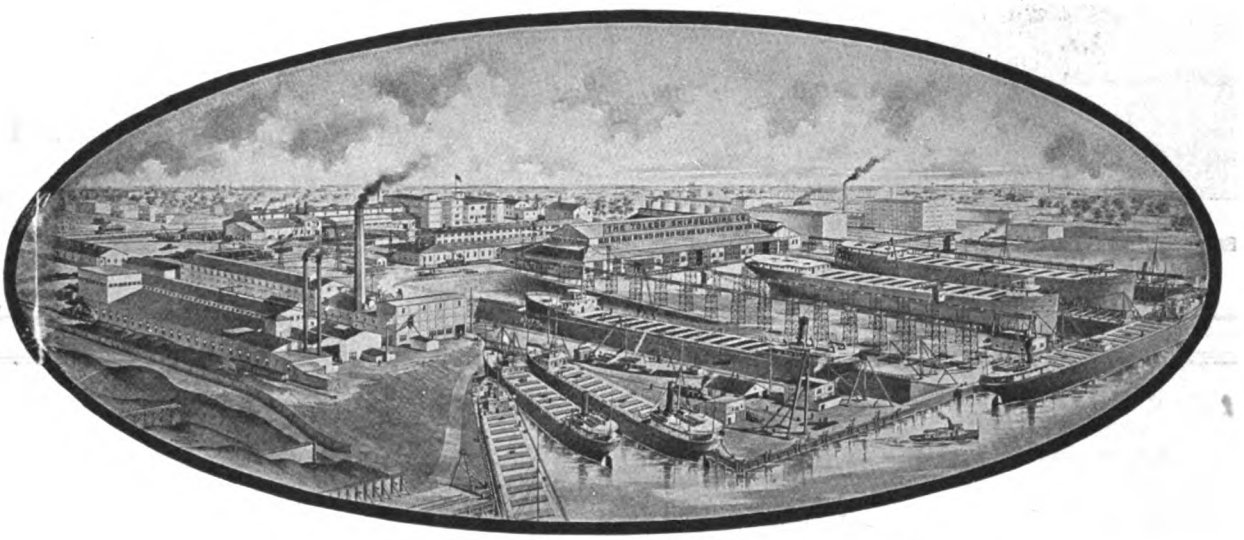

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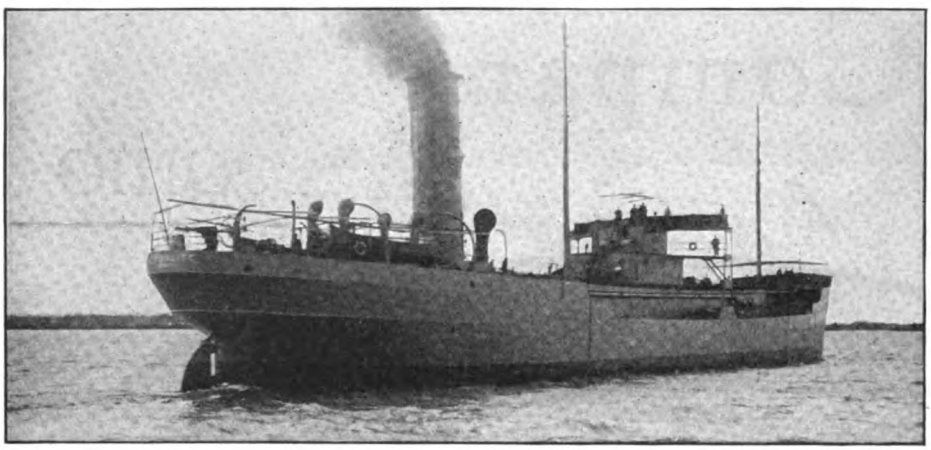

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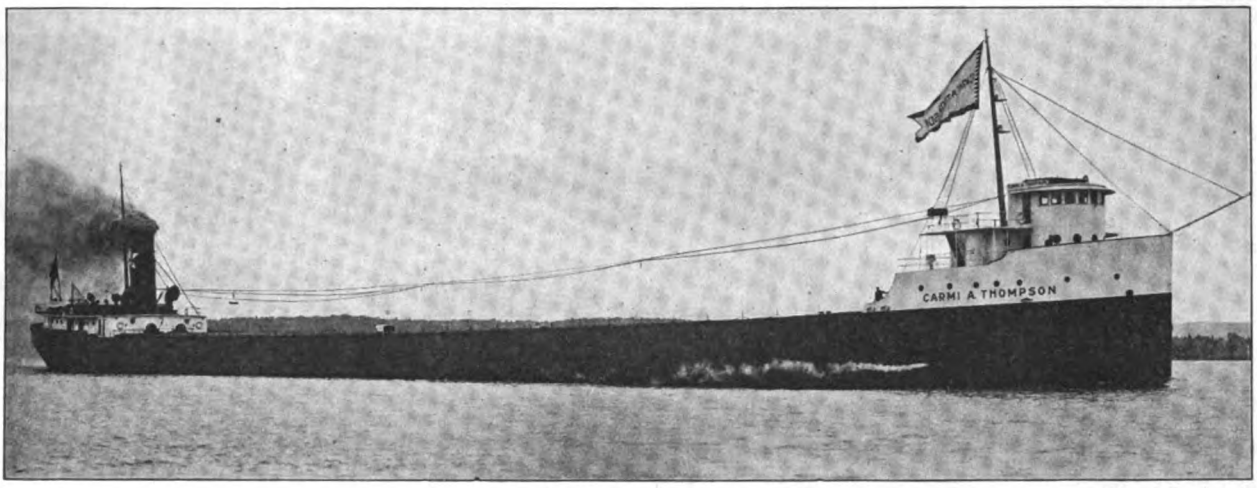

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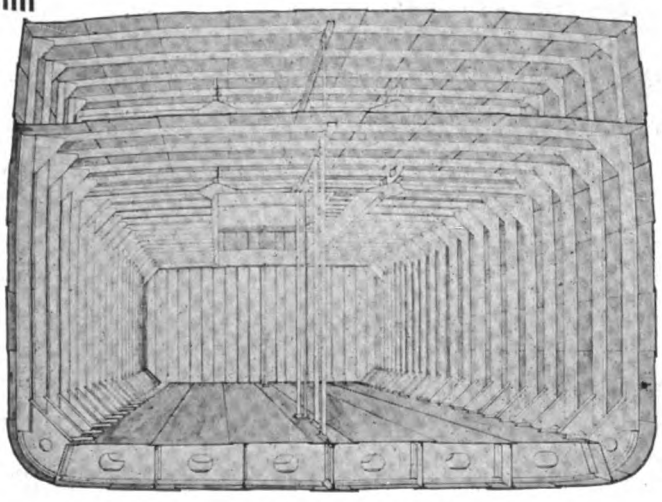

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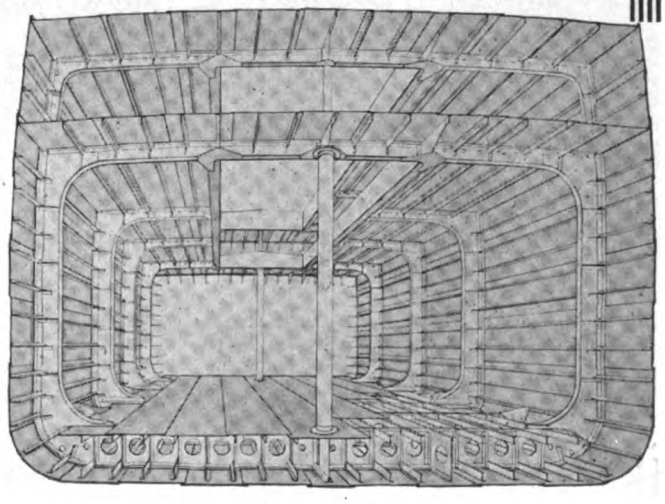

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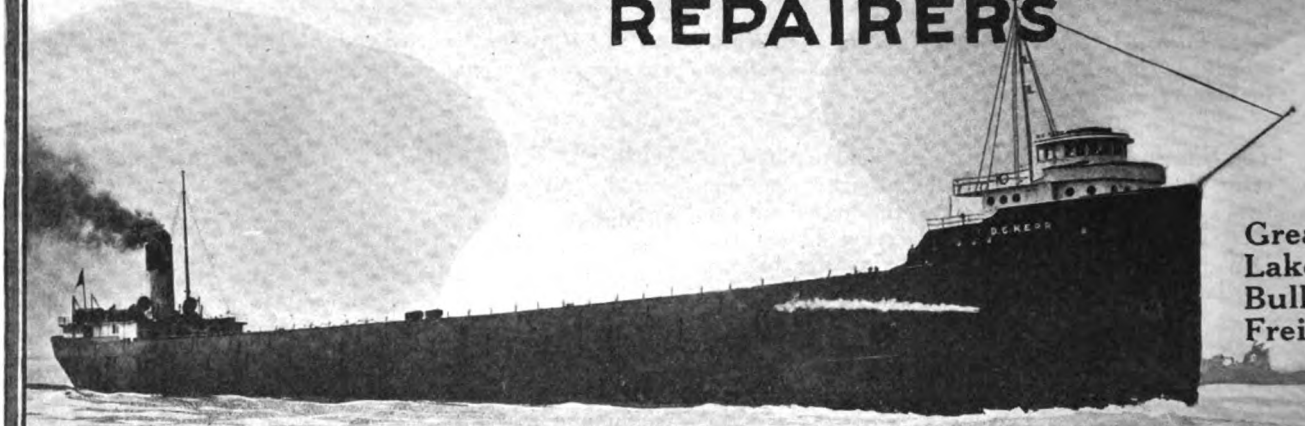

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	2	432	x 48	x 16
	3	340	x 48	x 17
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Milwaukee	1	300	x 42-3	x 12-6
	2	430	x 61	x 14
	Floating 73 long.			
Superior	1	570	x 60-6	x 14-6
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Dimensions cover length on blocks, width of gate and depth over sill.

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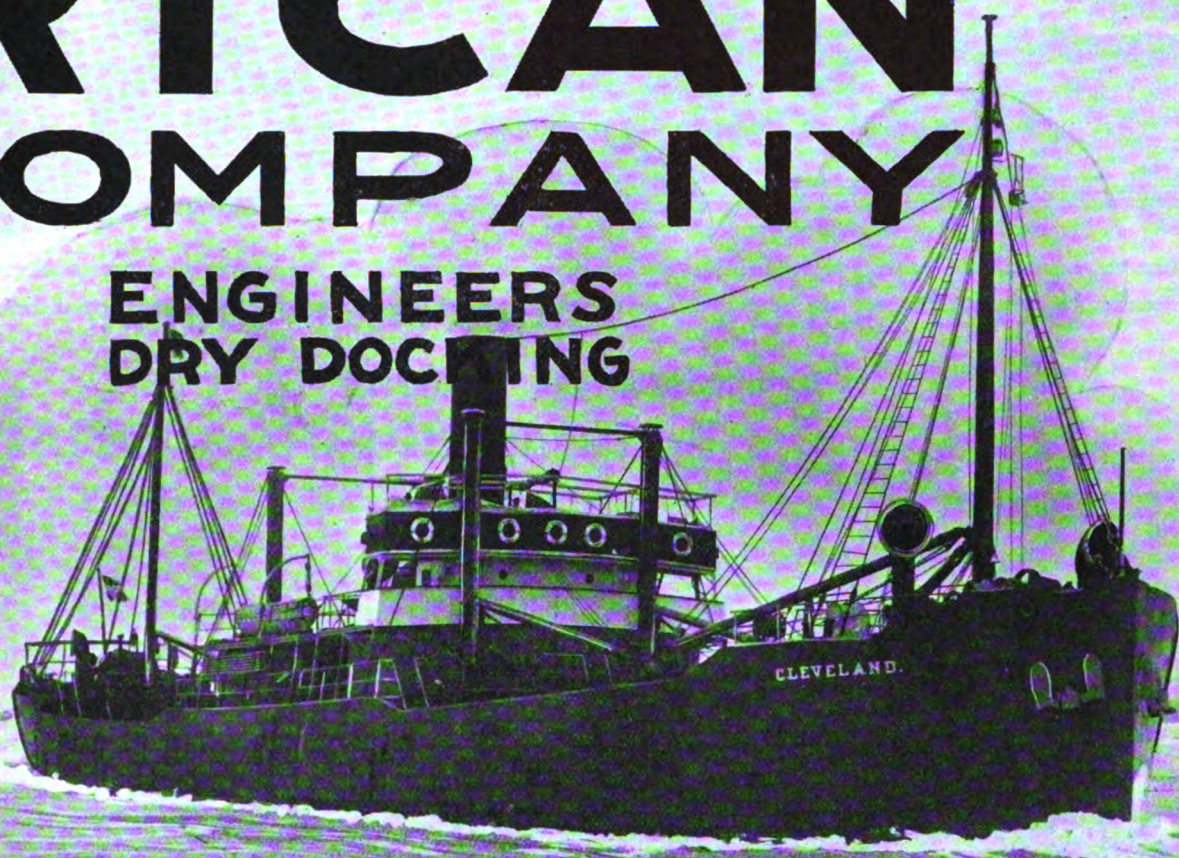

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Shipbuilders and Engineers
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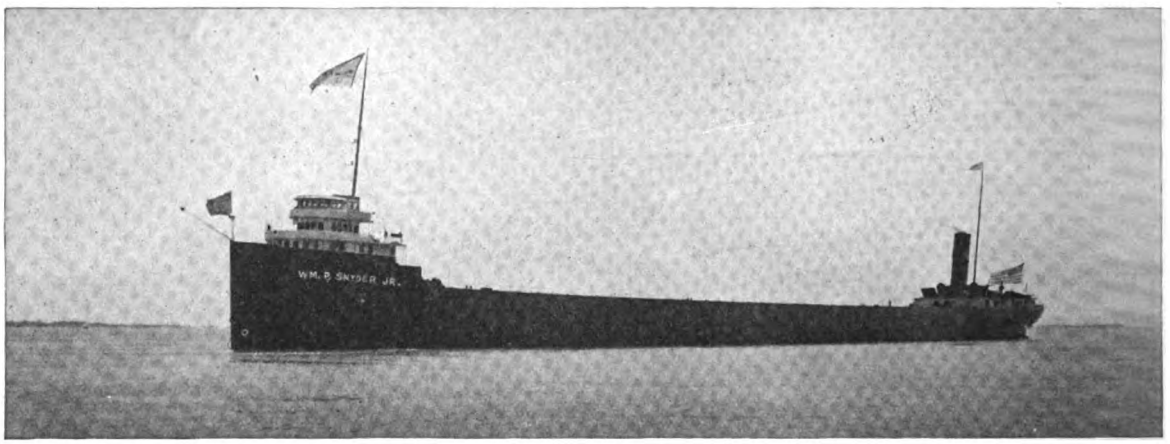

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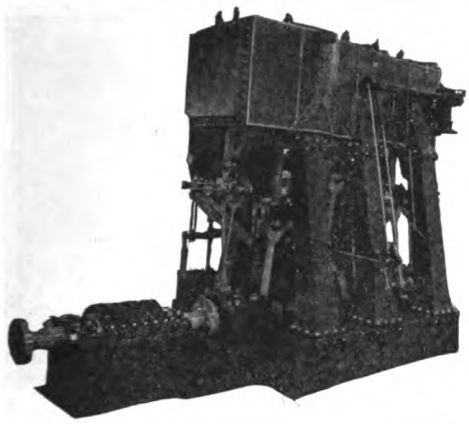

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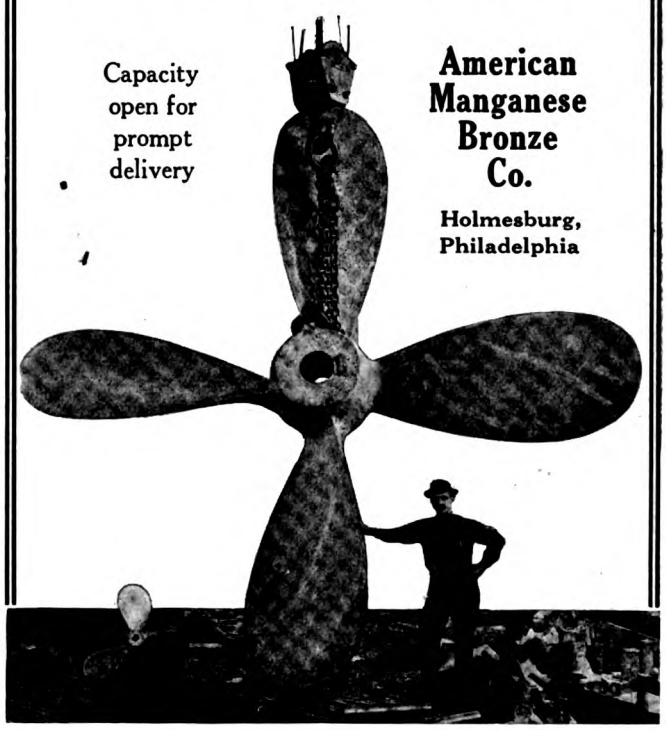

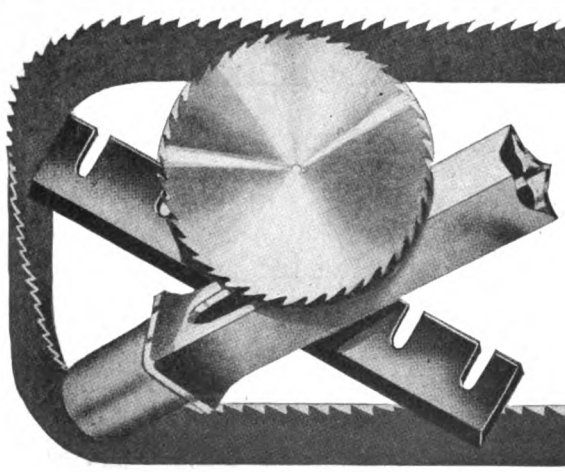

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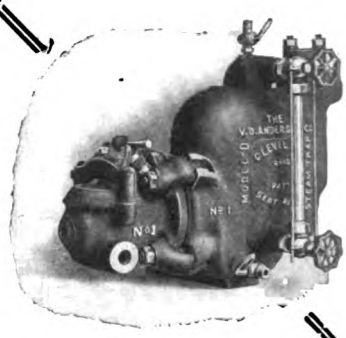

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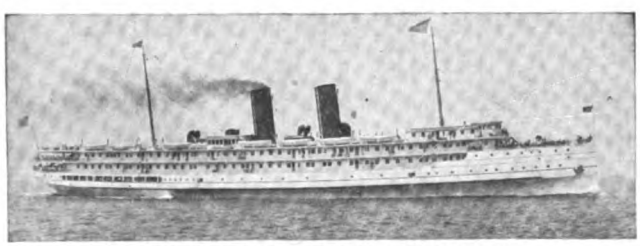

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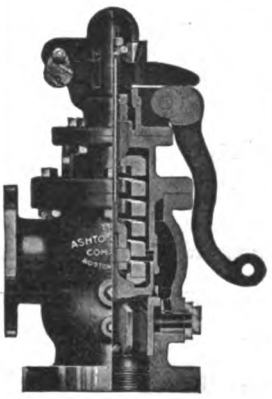

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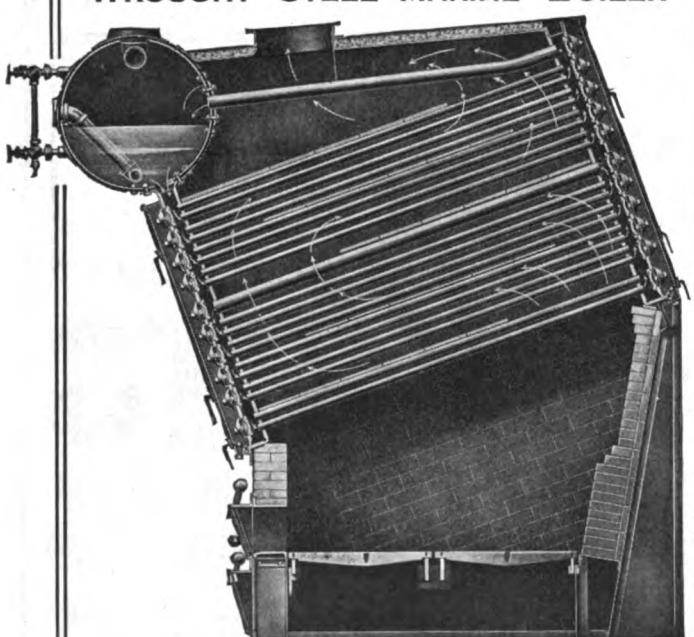

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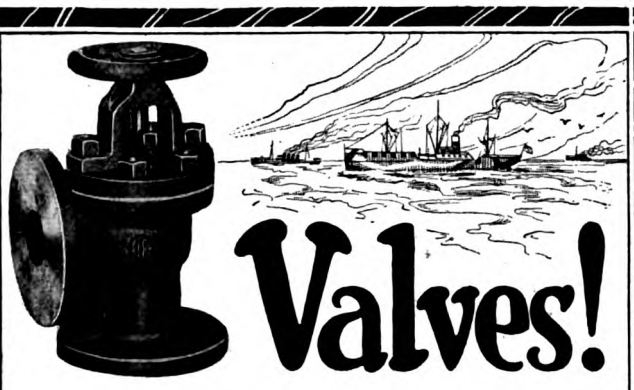

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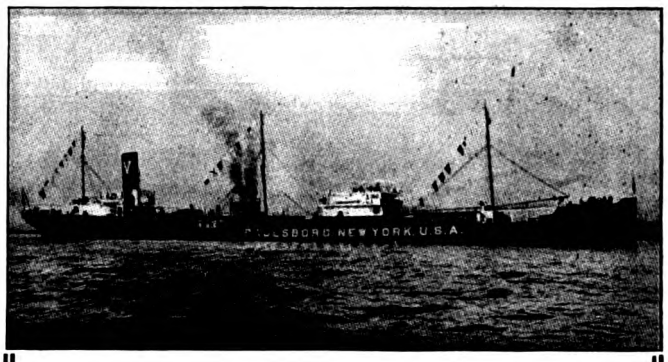

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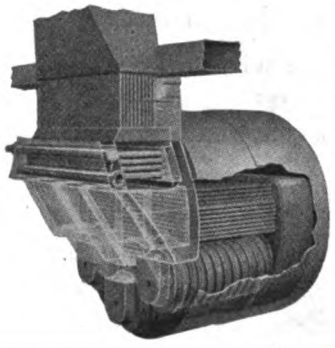

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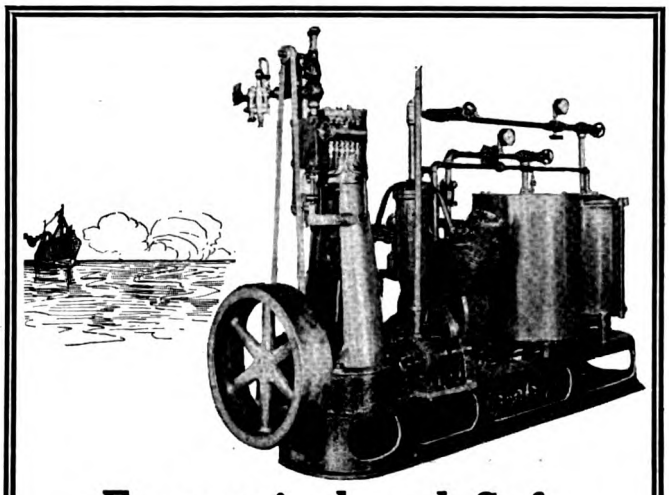

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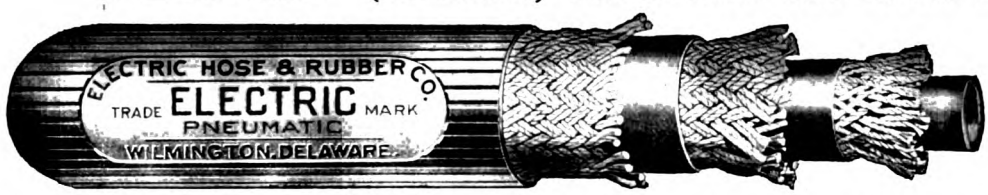

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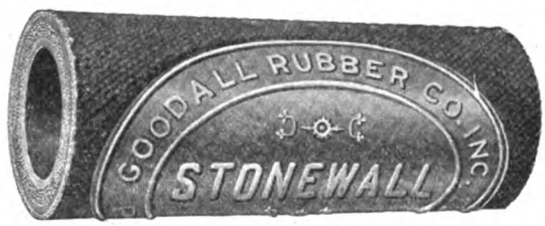

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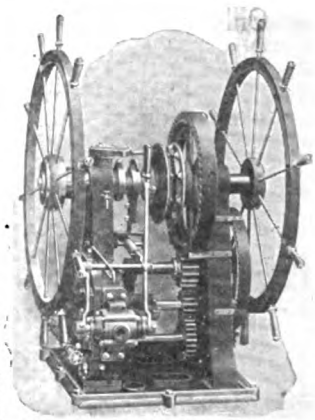

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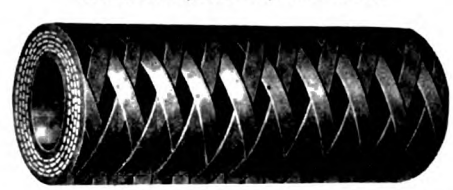

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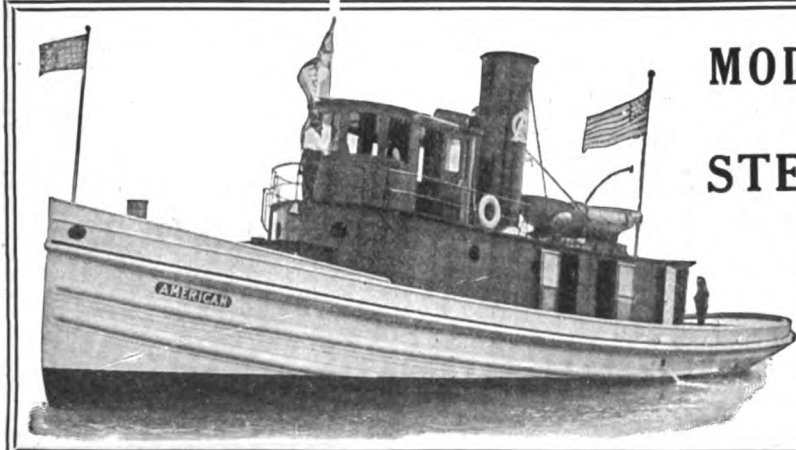

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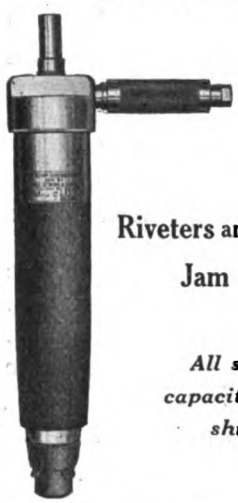

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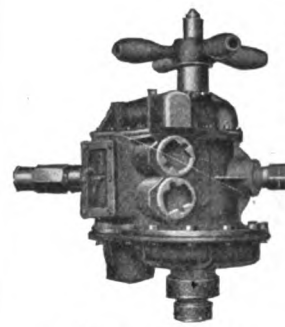

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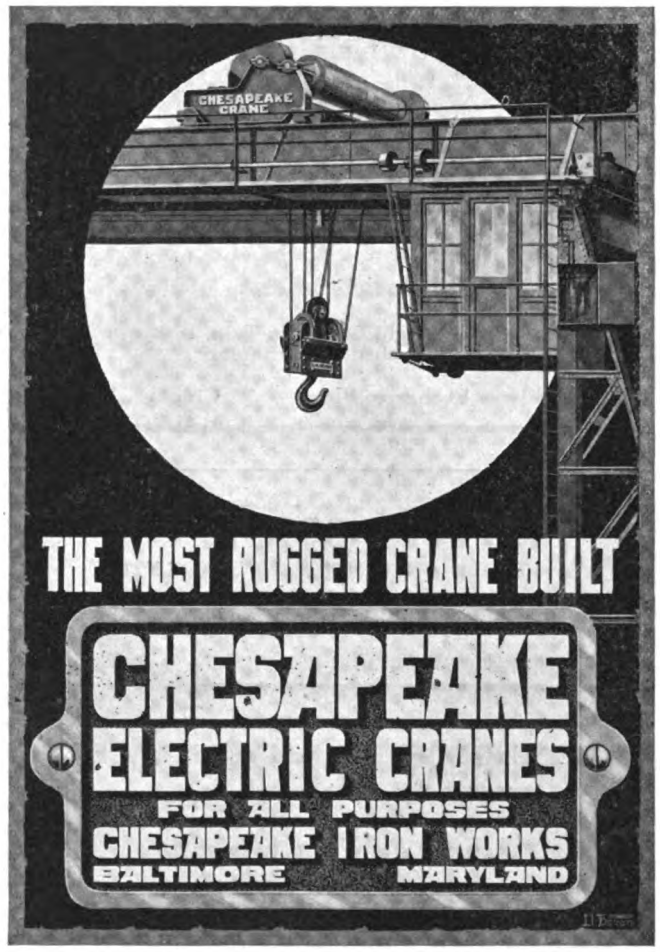

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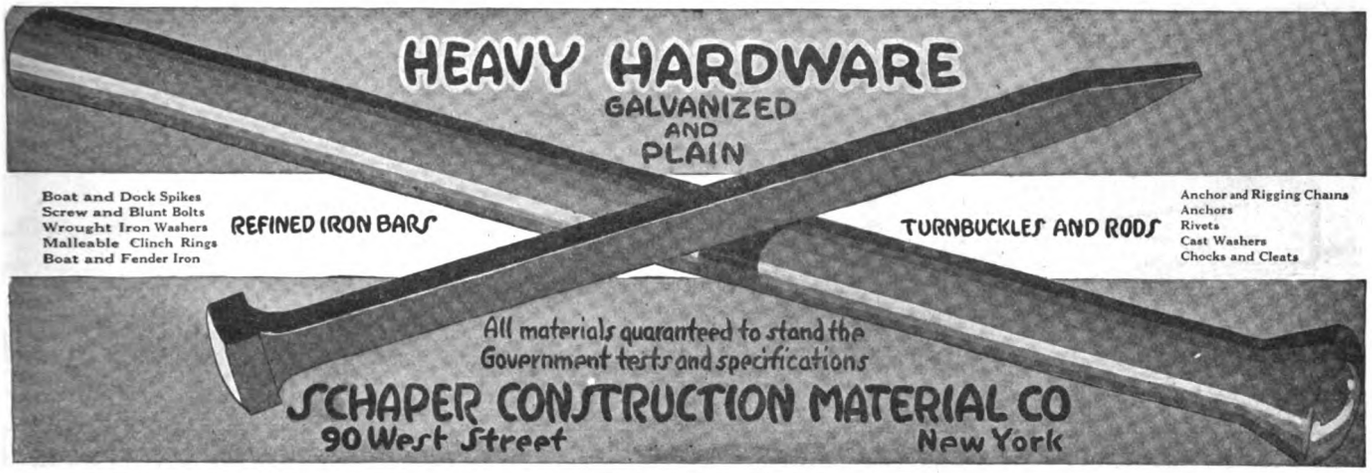

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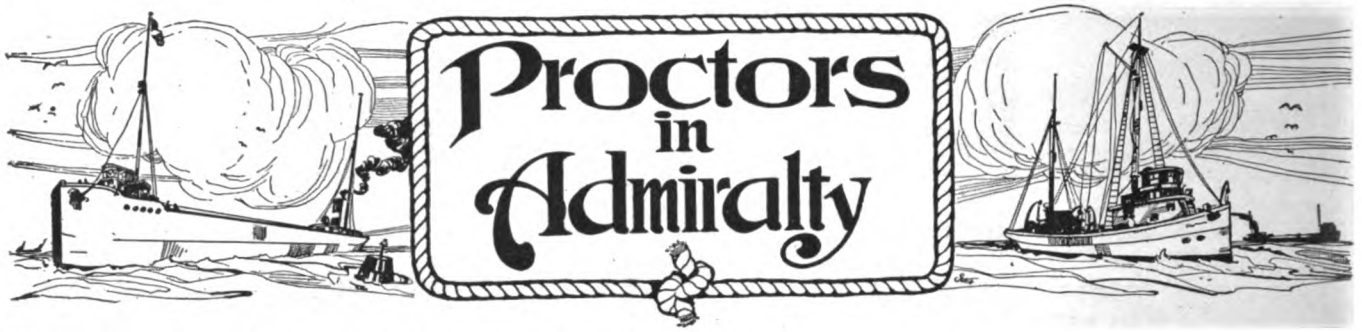

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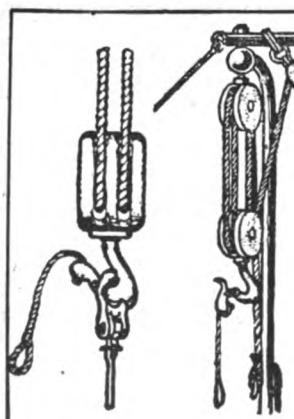

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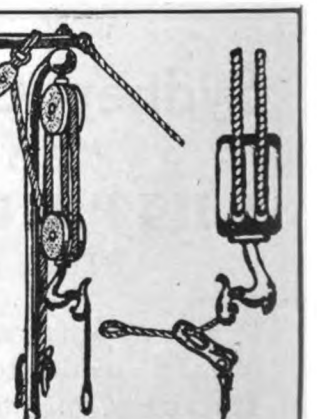

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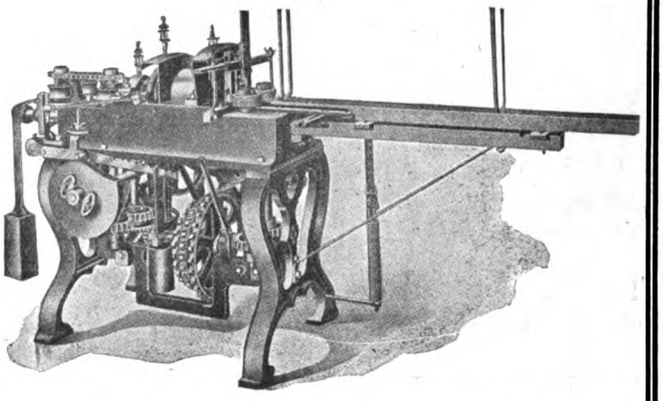

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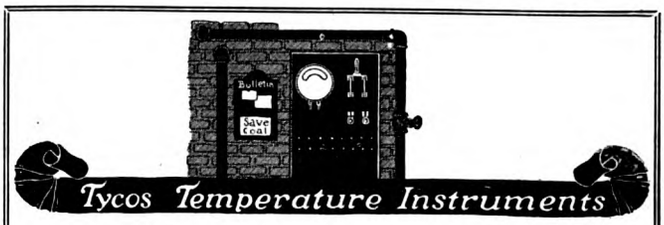

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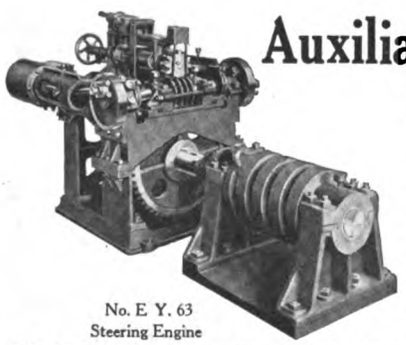

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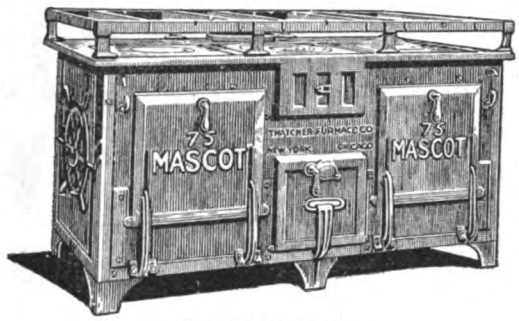

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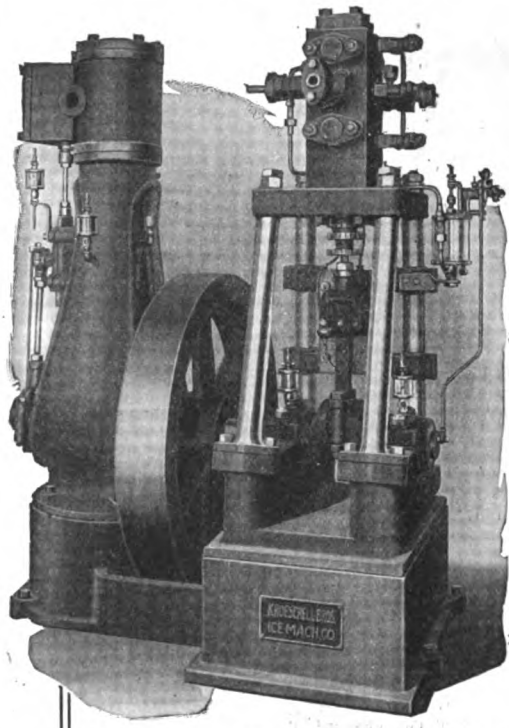

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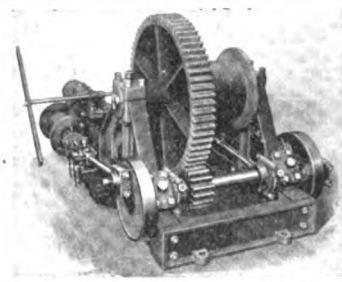

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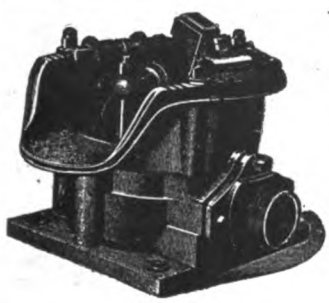

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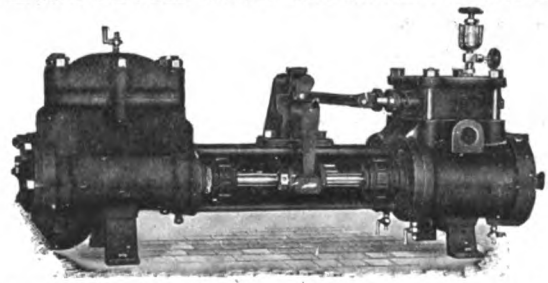

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Denver Rock Drill Mfg. Co., 18th and Blake Sts., Denver, Colo.
Electric Hose & Rubber Co., Wilmington, Del.

AIR PLANER
Shipbuilders' Pneumatic Tool Co., Chamber of Commerce Bldg., Portland, Oreg.

AIR TOOLS
Chgo. Pneumatic Tool Co., 1097 Fisher Bldg., Chgo.
Cleveland Pneumatic Tool Co., Cleveland, O.
Dayton Pneu. Tool Co., P. O. Box 1116, Dayton, O.
Oldham, Geo., & Son, Co., Frankford, Phila., Pa.
Shipbuilders' Pneumatic Tool Co., Chamber of Commerce Bldg., Portland, Oreg.

ANCHORS
Carpenter, Geo. B., & Co., 436 N. Wells St., Chgo.
Galbraith, C. C., & Son, 47-49 West St., New York.
Thacher, Geo. H., Co., Albany, N. Y.

ANGLE BEVELING AND PLANING MACHINES
Thomas Spacing Machine Co., Pittsburgh, Pa.

ANVILS
Columbian Hardware Co., Cleveland, Ohio.

APPLIANCES (Electrical)
Benjamin Electric Mfg. Co., Chicago, Ill.
Hart Mfg. Co., Hartford, Conn.

ARCHITECTS (Naval)
Donnelly, Wm. T., 17 Battery Place, New York.
Gielow & Orr, 52 Broadway, New York City.
Kidd, Jos. & Son, 406 Palladio Bldg., Duluth, Minn.
Lamm, A. H., Henry Bldg., Portland, Oreg.
Raymond, Capt. Francis L., Seattle, Wash.
Reid, John, & Co., 30 Church St., New York.
Smith Bros., 535 Marine Bank Bldg., Buffalo.

ARMOR (Submarine)
Morse, A. J., & Son, Boston, Mass.

ATTACHING PLUGS
Benjamin Electric Mfg. Co., Chicago, Ill.

ATTORNEYS AND PROCTORS IN ADMIRALTY
Davidson & Hudson, Sault Ste. Marie, Mich.
Gilchrist, Albert J., Cleveland, O.
Goulder, White & Garry, Cleveland, O.
Hartshorne, Insley & Leake, 239 Washington St., Jersey City, N. J.
Holding, Masten, Duncan & Leckie, 840-848 Rockefeller Bldg., Cleveland.
Hoyt, Dustin, Kelley, McKeehan & Andrews, Cleveland, O.
Kremer, C. E., 1012-1016 Ins. Exch. Bldg., Chgo.
Siggers & Siggers, Nat'l U. Ins. Bldg., Wash., D. C.
Stover & Stover, Wells Bldg., Milwaukee, Wis.
Warren, Cady, Ladd & Hill, Un. Tr. Bldg., Detroit.

AUDITORS
Cooley & Marvin Co., 708-12 Tremont Bldg., Boston

BAGS (Canvas)
Stanley, William W., 50 Church St., N. Y. C.

BAND SAWS (Adjustable Bevel)
Power, L., Co., 3 So. 23rd St., Philadelphia.

BARGES (Steel)
Dravo Cont. Co., Engineering Works Dept., Pgh.

BARS (Iron and Steel)
Carnegie Steel Co., Pittsburgh, Pa.
Commercial I. & S. Corp., 115 Broadway, N. Y. C.
Liberty Steel Pro. Co., Woolworth Bldg., N. Y. C.
Milton Mfg. Co., Milton, Pa.
Schaper Cons. Materials Co., 90 West St., N. Y. C.

BASKETS
Whyte, Oliver, Co., 21-23 Cornhill, Boston, Mass.

BEACONS (Gas)
Safety Car Heat. & Light. Co., 2 Rector St., N.Y.C.

BEAMS, CHANNELS AND ANGLES
Carnegie Steel Co., Pittsburgh, Pa.

BEDDING
Bernstein Mfg. Co., 3d St. and Alle. Ave., Phila.

BEDSTEADS
Bernstein Mfg. Co., 3d St. and Alle. Ave., Phila.
Cory, Chas., & Son, 290 Hudson St., New York.

BELAY POSTS (Cast Iron)
Central Foundry Co., 90 West St., New York.

BELLS (Electrical and Mechanical)
Benjamin Electric Mfg. Co., Chicago, Ill.
Cory, Chas., & Son, 290 Hudson St., New York.

BELTING (Rubber)
Voorhees Rubber Co., 20-56 Bostwick Ave., Jersey City, N. J.

BENDING AND STRAIGHTENING MACHINERY
United Engineering & Foundry Co., Pittsburgh, Pa.

BERTHS, BUNKS AND BEDS (Metal)
Bernstein Mfg. Co., 3d St. and Alle. Ave., Phila.

BEVELED FILLERS
Irving Iron Works Co., New York, N. Y.

BEVELING MACHINES (Angle)
Shipbuilders' Machinery Co., Inc., Seattle, Wash.

BIFFS AND DOUBLE BIFFS
Thacher, Geo. H., Co., Albany, N. Y.

BINNACLES
Ritchie, E. S., & Sons, Brookline, Mass.

BITTS AND CHOCKS
Chattanooga Roofing & Fdy. Co., Chattanooga, Tenn.
Louer, W. B., Co., Old Colony Bldg., Chicago, Ill.

BLOCKS
Boston & Lockport Block Co., 124 Condor St., E. Boston, Mass.

BLOWERS
American Blower Co., Detroit, Mich.
Howden, James & Co., Ltd., Wellsville, N. Y.
Reid, John & Co., 30 Church St., N. Y. C.

BLOWERS (Flue)
American Ship Building Co., Cleveland, O.

BLOWERS (Soot)
Diamond Power Specialty Co., Detroit, Mich.

BLUE PRINTING
N. Y. Blue Print & Paper Co., 96 Reade, N. Y. C.

BOILER CLEANING DEVICES
Geyser Boiler Ap. Co., 661 Atwater St., Detroit.

BOILER COVERING (Asbestos in Panels)
Carey Co., The, Euclid Ave., Cleveland, O.

BOILER NOZZLES (Welded Steel)
Cont. Iron Wks., West and Calyer Sts., Brooklyn.

BOILER RIVETS
Liberty Steel Pro. Co., Woolworth Bldg., N. Y. C.
Severance, S., Mfg. Co., Glassport, Pa.

BOILER ROOM FITTINGS
Crane Co., The, 836 S. Michigan Ave., Chicago.

BOILER STEAM AND WATER DRUMS (Welded)
Cont. Iron Wks., West and Calyer Sts., Brooklyn.

BOILERS (Marine)
Almy Water Tube Boiler Co., Providence, R. I.
American Ship Building Co., Cleveland, O.
Babcock & Wilcox Co., New York, N. Y.
Ballin Water Tube Boiler Co., E. Oak and E. Water Sts., Portland, Oreg.
Baltimore Dry Dock & Shipbuilding Co., Locust Point, Baltimore, Md.
Chicago Ship Bldg. Co., So. Chicago, Ill.
Collingwood Ship Bldg. Co., Ltd., Collingwood, Ont.
Commercial Boiler Works, The, Seattle, Wash.
Detroit Ship Building Co., Detroit, Mich.
Fletcher, W. & A. Co., Hoboken, N. J.
Great Lakes Engineering Works, Detroit, Mich.
Howden, James & Co., Ltd., Wellsville, N. Y.
Johnston Bros., Ferrysburg, Mich.
Lake Erie Boiler Works, Buffalo, N. Y.
MacKinnon Boiler & Machine Co., Bay City, Mich.
Manitowoc Ship Building Co., Manitowoc, Wis.
Milwaukee Dry Dock Co., Milwaukee, Wis.
New York Eng. Co., 2 Rector St., N. Y. C.
Oldman Boiler Wks., 36-40 Illinois St., Buffalo.
Pioneer Boiler Works, Bard and Merchant Sts., Port Huron, Mich.
Sun Shipbldg. Co., 1428 So. Penn Sq., Phila.
Superior Ship Bldg. Co., Superior, Wis.
Tietjen & Lang Dry Dock Co., Ft. of 17th St., Hoboken, N. J.
Todd Dry Docks, Inc., Harbor Island, Seattle, Wash.
Toledo Ship Building Co., Toledo, O.
Ward, Chas., Engrg. Wks., Charleston, W. Va.

BOILERS (Water Tube)
Almy Water Tube Boiler, Providence, R. I.
Ballin Water Tube Boiler Co., E. Oak and E. Water Sts., Portland, Oreg.
Bethlehem Shipbuilding Corp., Bethlehem, Pa.
New York Eng. Co., 2 Rector St., N. Y. C.
Ward, Chas., Engrg. Wks., Charleston, W. Va.

BOLT DRIVERS
Denver Rock Drill Mfg. Co., 18th and Blake Sts., Denver, Colo.

BOLT ROPE (Manila)
Whitlock Cordage Co., New York, N. Y.

BOLTS AND NUTS
Bayonne Bolt & Nut Co., Bayonne, N. J.
Com'l Iron & Steel Corp., 115 Broadway, N. Y. C.
Davis, E. S., Inc., 149 Broadway, New York City.
Drake Lock Nut Co. of Ohio, Cleveland.
Larkin, J. K., & Co., New York, N. Y.
Liberty Steel Pro. Co., Woolworth Bldg., N. Y. C.
Milton Mfg. Co., Milton, Pa.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Schaper Con. Materials Co., 90 West St., N. Y. C.

BOLTS (Galvanized)
Bayonne Bolt & Nut Co., Bayonne, N. J.
Schaper Con. Materials Co., 90 West St., N. Y. C.

BOOKS
Longmans, Green & Co., 4th Ave. and 30th St., New York City.
Penton's Book News, Cleveland, O.

BRASS AND COPPER
Stimpson, Edwin B., Co., Brooklyn, N. Y.

BRASS GOODS AND SPECIALTIES
Detroit Ship Building Co., Detroit, Mich.
Lunkenheimer Co., The, Cincinnati, O.

BRAZING OUTFITS
Linde Air Pro. Co., 42d St. Bldg., N. Y. C.
Penberthy Injector Co., Detroit, Mich.
Stimpson, Edwin B., Co., Brooklyn, N. Y.

BROKERS (Customhouse, Marine and Insurance)
Grandfield, W. J., & Co., Philadelphia, Pa.

BROKERS (Vessel)
Chicago Steamboat Exchange, Chicago, Ill.
Boland & Cornelius, 1204 Prudential Bldg., Buffalo
Farley, Edward P., Co., Chicago, Ill.
Gielow & Orr, 52 Broadway, New York City.
Richardson, W. C., & Co., 816-818 Leader-News Bldg., Cleveland.

BRUSHES (Vulcan Rubber Cemented)
Whiting, John L.-Adams, J. J., Co., Boston, Mass.

BUCKETS (Canvas-Collapsible)
Stanley, William W., 50 Church St., New York City.

BUOYS
Safety Car Heat. & Light Co., 2 Rector St., N.Y.C.

BURNERS (Acetylene)
Linde Air Products Co., 42d St. Bldg., N. Y. C.

BUSHINGS (Bronzed, Oil Grooved)
Wellman Prod. Co., The, 1444 E. 49th St., Clevd.

BUTTONS (Water Tight, Push)
Benjamin Electric Mfg. Co., Chicago, Ill.

CABLES
Waterbury Co., 63 Park Row, New York City.
Whitlock Cordage Co., New York, N. Y.

CAM SHAFTS
Camden Frg. Co., 8th and Bulson Av., Camden, N. J.

CANVAS ROOFINGS
Robeson Preservo Co., 401 White Block, Port Huron, Mich.

CAPSTANS
Carpenter, Geo. B., & Co., 436 N. Wells St., Chgo.
Chase Mach. Co., The, 2313 Elm St., N. W., Clevd.
Dake Engine Co., Grand Haven, Mich.

CAPSTANS (Cast Iron)
Central Foundry Co., 90 West St., New York.

CASTINGS
Chattanooga Roofing & Fdy. Co., Chattanooga, Tenn.
Collingwood Ship Bldg. Co., Collingwood, Ont.
Crane Co., The, 836 S. Michigan Ave., Chicago.
Great Lakes Engineering Works, Detroit, Mich.
Hardie-Tynes Mfg. Co., Birmingham, Ala.
Louer, W. B., Co., Old Colony Bldg., Chicago, Ill.

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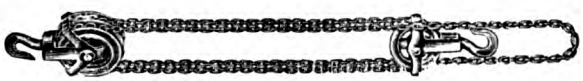

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United Engineering & Foundry Co., Pittsburgh, Pa.

CASTINGS (Bronze)
American Mang. Bronze Co., Holmesburg, Phila.

CAULKING COTTON
Stratford, Geo., Oakum Co.,
165 Cornelison Ave., Jersey City, N. J.

CAULKING HAMMERS (Pneumatic)
Cleveland Pneumatic Tool Co., Cleveland, O.
Dayton Pneu. Tool Co., P. O. Box 1116, Dayton, O.
Indepen. Pneu. Tool Co., 600 Jackson Blvd., Chgo.
Ingersoll-Rand Co., 11 Broadway, New York City.

CHAINS
American Chain Co., Inc., Bridgeport, Conn.
Carpenter, Geo. B., & Co., 436 N. Wells St., Chgo.
Hobbs, Clinton E., Co., Boston, Mass.
Larkin, J. K., & Co., New York, N. Y.
Schaper Cons. Materials Co., 90 West St., N. Y. C.

CHAINS (Marine)
American Chain Co., Inc., Bridgeport, Conn.

CHAINS (Ship Cable)
American Chain Co., Inc., Bridgeport, Conn.

CHAINS (Steering Gear)
American Chain Co., Inc., Bridgeport, Conn.

CHAINS (Stud Link)
American Chain Co., Inc., Bridgeport, Conn.
Liberty Steel Pro. Co., Woolworth Bldg., N. Y. C.

CHIPPING HAMMERS (Pneumatic)
Chicago Pneu. Tool Co., 1097 Fisher Bldg., Chgo.
Cleveland Pneumatic Tool Co., Cleveland, O.
Dayton Pneu. Tool Co., P. O. Box 1116, Dayton, O.

CHISEL BLANKS (Pneumatic)
Chicago Pneu. Tool Co., 1097 Fisher Bldg., Chgo.
Cleveland Pneumatic Tool Co., Cleveland, O.
Dayton Pneu. Tool Co., P. O. Box 1116, Dayton, O.
Indepen. Pneu. Tool Co., 600 Jackson Blvd., Chgo.

CHOCKS
Thacher, Geo. H., Co., Albany, N. Y.

CIRCULATORS (Boiler)
Eckliff Circulator Co., 54 Shelby St., Detroit, Mich.
McNab Co., Bridgeport, Conn.

CLASSIFICATION SOCIETY
American Bureau of Shipping, New York City.

CLEATS
Schaper Con. Materials Co., 90 West St., N. Y. C.
Thacher, Geo. H., Co., Albany, N. Y.

CLEATS (Cast Iron)
Central Foundry Co., 90 West St., New York.

CLINCH RINGS
Liberty Steel Pro. Co., Woolworth Bldg., N. Y. C.
Schaper Con. Materials Co., 90 West St., N. Y. C.

COAL HANDLING MACHINERY (See Machinery, Coal Handling)

COAL (Producers and Shippers)
Hall, Geo., Coal & Trans. Co., Ogdensburg, N. Y.
Hanna, M. A., & Co., Cleveland, O.
Loain Coal & Dock Co., Columbus, O.
Pickands, Mather & Co., Cleveland, O.

COATINGS
Amer. Bitumastic Enam. Co., 17 Battery Pl., N.Y.C.

COLUMNS (Water)
Anderson, The V. D., Co., Cleveland, O.

COMPASSES
Ritchie, E. S., & Sons, Brookline, Mass.
Taylor Instrumental Companies, Rochester, N. Y.

COMPRESSORS (Air)
Chicago Pneu. Tool Co., 1097 Fisher Bldg., Chgo.
Louer, W. B., Co., Old Colony Bldg., Chicago, Ill.

CONCRETE BARGES
Federal Shipbldg. Co., 220 Majestic Bldg., Detroit.

CONDENSERS
Davis, E. S., Inc., 149 Broadway, New York City.
Great Lakes Engineering Works, Detroit, Mich.
Smart-Turner Machine Co., Ltd.,
191 Barton St., East, Hamilton, Ont., Can.
Westinghouse Elec. & Mfg. Co., E. Pgh., Pa.

CONDENSER SHELLS (Welded Steel)
Cont'ntal Iron Wks., West and Calyer Sts., Brooklyn
Westinghouse Elec. & Mfg. Co., E. Pgh., Pa.

CONDUIT FITTINGS (Water Tight)
Crouse-Hinds Co., Syracuse, N. Y.

CONVEYORS
General Electric Co., Schenectady, N. Y.

COPPER PAINT
Interna. Compositions Co., Inc., 18 B'dway, N.Y.C.

CORDAGE
Carpenter, Geo. B., & Co., 436 N. Wells St., Chgo.

CORDAGE (Manila, Sisal and Other Hard Fiber Rope)
Waterbury Co., 63 Park Row, New York, N. Y.
Whitlock Cordage Co., 46 Church St., New York.

CORK JACKETS AND CORK RINGS
Williams, Wm. E., New York, N. Y.

COST ACCOUNTANTS
Cooley & Marvin Co., 708-12 Tremont Blg., Boston

COUNTERSINKING MACHINES (Portable)
Shipbuilder's Machinery Co., Inc., Seattle, Wash.

CRANES (Electric Traveling, Jib, Hand)
American Engineering Co., Philadelphia, Pa.
Chesapeake Iron Works, Baltimore, Md.
Dravo Contracting Co., Engrg. Works Dept.,
Pittsburgh, Pa.
General Electric Co., Schenectady, N. Y.
Lakeside Bridge & Steel Co.,
121 Villard St., Milwaukee, Wis.
Louer, W. B. Co., Old Colony Bldg., Chicago, Ill.
Milwaukee Elec. Crane & Mfg. Co., Milwaukee.
Shepard Electric Crane & Hoist Co.,
Montour Falls, N. Y.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES (Hydraulic)
United Engineering & Foundry Co., Pittsburgh, Pa.

CRANES (Locomotive)
Industrial Works, Bay City, Mich.
Milwaukee Elec. Crane & Mfg. Co., Milwaukee.

CRANES (Steam, Electric, Gasoline)
Byers, John F., Machine Co.,
230 Sycamore St., Ravenna, O.
Dravo Contracting Co., Engrg. Works Dept.,
Pittsburgh, Pa.
Industrial Works, Bay City, Mich.

CUTTERS (Pipe)
Curtis & Curtis Co., 525 Garden St., Bdgep't, Conn.

CUTTING APPARATUS (Oxyacetylene)
Milburn, The Alexander, Co., Baltimore, Md.

CUTTING AND WELDING (Electric Arc)
Pioneer Boiler Works,
Bard and Merchant Sts., Port Huron, Mich.
Westinghouse Elec. & Mfg. Co., E. Pgh., Pa.

CUTTING AND WELDING (Oxyacetylene Process)
Linde Air Pro. Co., 42d St. Bldg., N. Y. C.

CYLINDERS (Welded)
Continental Iron Works, The, Brooklyn, N. Y.

DAVITS AND DAVIT FALLS
Welin Marine Equipment Co.,
305 Vernon Ave., Long Island City, N. Y.

DECK BOLTS
Bayonne Bolt & Nut Co., Bayonne, N. J.
Larkin, J. K., & Co., New York, N. Y.
Milton Mfg. Co., Milton, Pa.
Liberty Steel Pro. Co., Woolworth Bldg., N. Y. C.
Schaper Con. Materials Co., 90 West St., N. Y. C.

DECKING (Marine)
Marine Decking & Supply Co.,
1011 Chestnut St., Philadelphia.

DERRICKS
Carnegie Steel Co., Pittsburgh, Pa.
Louer, W. B., Co., Old Colony Bldg., Chicago, Ill.

DERRICKS (Steel)
Lakeside Bridge & Steel Co.,
121 Villard St., Milwaukee, Wis.

DIES
Curtis & Curtis Co.,
525 Garden St., Bridgeport, Conn.
Keller Pneumatic Tool Co., Grand Haven, Mich.

DISTILLING APPARATUS (Water)
Griscom-Russell Co.,
2121 West St. Bldg., New York City.
Hodges Water Still Co., Inc., Yardley, Pa.
Schutte & Koerting Co.,
12th and Thompson St., Philadelphia.

DIVING APPARATUS
Morse, Andrew L. & Son, Inc.,
221 High St., Boston, Mass.

DRAFT (Artificial and Mechanical for Boilers)
American Blower Co., Detroit, Mich.
American Ship Building Co., Cleveland, O.
Great Lakes Engineering Works, Detroit, Mich.
Howden, James & Co., Ltd., Wellsville, N. Y.
Reid, John, & Co., 30 Church St., New York City.

DRAG LINE EXCAVATORS
Dravo Cont. Co., Engineering Wks. Dept., Pgh., Pa.

DREDGING MACHINERY
American Engrg. Co., Philadelphia, Pa.
Dravo Cont. Co., Engineering Wks. Dept., Pgh., Pa.
Great Lakes Engineering Works, Detroit, Mich.
Morris Machine Works, Baldwinsville, N. Y.
Superior Ship Building Co., Superior, Wis.

DREDGING OUTFIT CONSTRUCTORS
Buffalo Dry Dock Co., Buffalo, N. Y.
Dravo Contracting Co., Engrg. Works Dept.,
Pittsburgh, Pa.
Morris Machine Works, Baldwinsville, N. Y.

DRILLS (Air)
Chicago Pneu. Tool Co., 1097 Fisher Bldg., Chgo.
Cleveland Pneumatic Tool Co., Cleveland, O.
Denver Rock Drill Mfg. Co.,
18th and Blake Sts., Denver, Colo.

DRILLS (Electric)
Indepen. Pneu. Tool Co., 600 Jackson Blvd., Chgo.
Ingersoll-Rand Co., 11 Broadway, New York City.

DRILLS (Pneumatic)
Denver Rock Drill Mfg. Co.,
18th and Blake Sts., Denver, Colo.
Indepen. Pneu. Tool Co., 600 Jackson Blvd., Chgo.
Ingersoll-Rand Co., 11 Broadway, New York City.

DRILLS (Steam)
Denver Rock Drill Mfg. Co.,
18th and Blake Sts., Denver, Colo.

DRILL SHARPENERS
Denver Rock Drill Mfg. Co.,
18th and Blake Sts., Denver, Colo.

DROPS (Wharf)
American Engineering Co., Philadelphia, Pa.

DRY DOCKS
American Ship Building Co., Cleveland, O.
Baltimore Dry Dock & Shipbuilding Co.,
Locust Point, Baltimore, Md.
Buffalo Dry Dock Co., The, Buffalo, N. Y.
Chicago Ship Building Co., Chicago, Ill.
Collingwood Ship Bldg. Co., Ltd.,
Collingwood, Ont., Can.
Detroit Ship Building Co., Detroit, Mich.
Foundation Co., The-Port Huron Shipyards, Inc.,
Port Huron, Mich.
Great Lakes Engineering Works, Detroit, Mich.
Manitowoc Ship Building Co., Manitowoc, Wis.
Milwaukee Dry Dock Co., Milwaukee, Wis.
Rocky River Dry Dock Co., Rocky River, O.
Sun Shipbuilding Co., 1428 So. Penn Sq., Phila.
Superior Ship Building Co., Superior, Wis.
Tietjen & Lang Dry Dock Co.,
Ft. of 17th St., Hoboken, N. J.
Todd Dry Docks, Inc., Harbor Island, Seattle, Wash.
Toledo Ship Building Co., Toledo, O.
Twin City Shipbuilding Co., Benton Harbor, Mich.

DRY DOCK PACKING
Voorhees Rubber Co., 20-56 Bostwick Ave.,
Jersey City, N. J.

DUCK (Canvas and Cotton)
Stanley, William W., 50 Church St., New York City.

DYNAMOS
General Electric Co., Schenectady, N. Y.

ECCENTRIC SHAFTS
Camden Forge Co., 8th and Bulson, Camden, N. J.

EJECTORS
American Injector Co., 176 14th St., Detroit, Mich.
Westinghouse Elec. & Mfg. Co., E. Pgh., Pa.

EJECTORS (Ash)
Great Lakes Engineering Co., Detroit, Mich.

ELECTRICAL DEVICES
Benjamin Electric Mfg. Co., Chicago, Ill.
Bryant Electric Co., Bridgeport, Conn.
Hart Mfg. Co., Hartford, Conn.

ELECTRICAL EQUIPMENT
American Blower Co., Detroit, Mich.
Benjamin Electric Mfg. Co., Chicago, Ill.
Bryant Electric Co., Bridgeport, Conn.
Crouse-Hinds Co., Syracuse, N. Y.
Hart Mfg. Co., Hartford, Conn.
Livingston, J., & Co., Inc.,
Grand Central Terminal, New York, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pgh., Pa.

ELECTRICAL RECEPTACLES
Bryant Electric Co., Bridgeport, Conn.
Hart Mfg. Co., Hartford, Conn.

ELECTRIC SIGNALS
Klaxon Company, Industrial Division,
33 W. 42d St., New York City.

ELEVATORS GATES
Whyte, Oliver, Co., 21-23 Cornhill, Boston, Mass.

ENAMELS (Marine, Exterior, Interior)
American Bitumastic Enamels Co.,
17 Battery Place, New York City.
Du Pont De Nemours, E. I., & Co., Wilmington, Del.
Natroco Paint & Varnish Works, Tonawanda, N. Y.

ENGINEERS AND CONTRACTORS
Chesapeake Iron Works, Baltimore, Md.
Dravo Contracting Co., Engrg. Works Dept.,
Pittsburgh, Pa.
United Engineering & Foundry Co., Pittsburgh, Pa.

ENGINEERS (Marine, Mechanical and Consulting)
Dravo Cont. Co., Eng. Wks. Dept., Pgh., Pa.
Great Lakes Engineering Works, Detroit, Mich.
Griscom-Russell Co., New York, N. Y.
Donnelly, Wm. T., 17 Battery Pl., N. Y. C.
Smith Bros., 535 Marine Bank Bldg., Buffalo, N. Y.
Todd Dry Docks, Inc., Harbor Island, Seattle, Wash.

ENGINEERS' SPECIALTIES
Carpenter, Geo. B., & Co., 436 N. Wells St., Chgo.
Lunkenheimer Co., The, Cincinnati, O.
Penberthy Injector Co., Detroit, Mich.

ENGINES
American Blower Co., Detroit, Mich.
Morris Machine Works, Baldwinsville, N. Y.
Reid, John & Co., 30 Church St., N. Y. C.
Superior Iron Works, Superior, Wis.
United Engineering & Foundry Co., Pittsburgh, Pa.

ENGINES (Diesel)
Fairbanks, Morse & Co., New York, N. Y.

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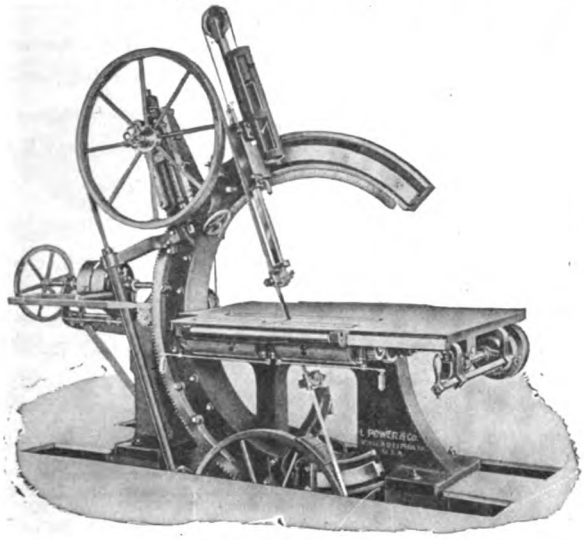

The Original and Standard Machine for wooden boat building for sixteen years.
Angles to 45 degrees each side of centre.
Power and hand movement to sliding wheel frame.
Power driven feed rolls in table to the front and back of saw instantly raised or lowered.
Automatic tighteners to belts.

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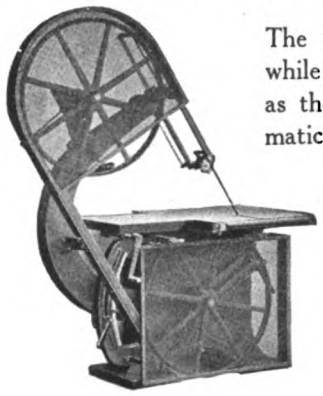
All the Machines for Building Wooden Boats

Crescent Angle Band Saws

Are built in two sizes, especially for Ship Yard use



The angle may be changed while the machine is in motion as the tilting operation automatically takes care of all adjustments. There is no belt length to adjust, and guides and table keep their proper positions. The machine is simple in operation and is of rigid construction.

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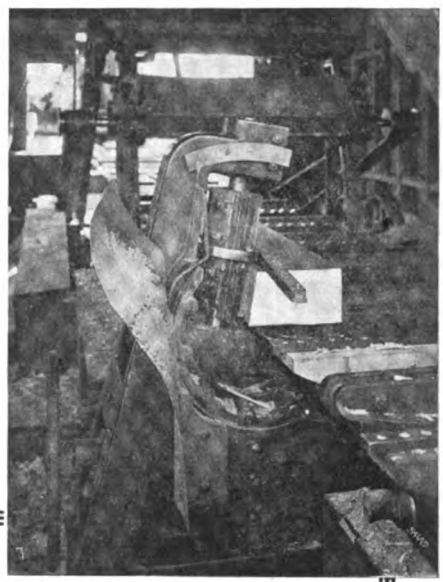
This illustration shows the combined beveling, reverse beveling and curving possibilities of our ***Beveling Side Head.***

This side, having started to bevel the other end of this timber at eleven degrees to the left, is here shown coming out of the cut at eleven degrees to the right.



Patented July 12, 1917
Patents applied for in Canada.

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SUCCESSORS TO
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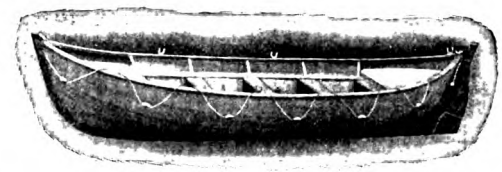

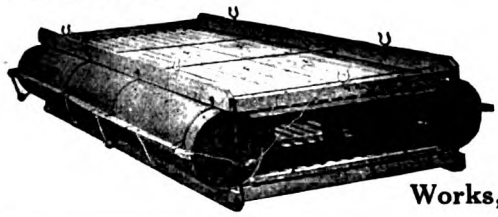

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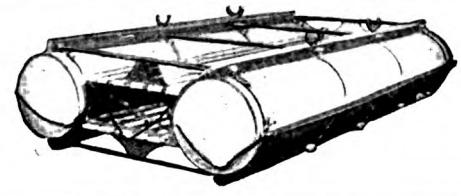

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Liberty Steel Products Co., Woolworth Bldg., N.Y.C.

NAILS, WIRE (Coated)
Larkin, J. K., & Co., New York, N. Y.
Liberty Steel Products Co., Woolworth Bldg., N.Y.C.

NAUTICAL INSTRUMENTS
Carpenter, Geo. B., & Co., 436 N. Wells St., Chicago.
Ritchie, E. S., & Sons, Brookline, Mass.

NUTS (See Bolts and Nuts)

NUTS (Lock)
Drake Lock Nut Co. of Ohio, Cleveland, O.

OAKUM
American Mfg. Co., Brooklyn, N. Y.
Carpenter, Geo. B., & Co., 436 N. Wells St., Chicago.
Galbraith, C. C., & Son, 47-49 West St., N. Y. C.
Stratford, Geo., Oakum Co., 165 Cornelison Ave., Jersey City, N. J.

OIL CUPS
American Injector Co., 176 14th St., Detroit, Mich.
Lunkenheimer Co., The, Cincinnati, O.

OIL (Marine)
Borne, Scrymser Co., 80 South St., New York City.

OXY-ACETYLENE WELDING AND CUTTING APPARATUS
Milburn, The Alexander, Co., Baltimore, Md.

OXY-ACETYLENE WELDING AND CUTTING
Linde Air Products Co., 42nd Street Bldg., N. Y. C.

OXYGEN
Linde Air Products Co., 42nd Street Bldg., N. Y. C.

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Carpenter, Geo. B., & Co., 436 N. Wells St, Chicago
Crane Co., The, 836 S. Michigan Ave., Chicago.
Diamond Rubber Co., Akron, O.
Goodall Rubber Co., Inc., Philadelphia, Pa.
Mantell Packing Co., The, Elyria, O.
U. S. Metallic Packing Co., The, Philadelphia.

PACKING (Black Sheet)
Voorhees Rubber Co., 20-56 Bostwick Ave., Jersey City, N. J.

PACKING (Metallic)
Cassco Bar-Metallic Packing Co., 8 So. Dearborn St., Chicago.

PAINT (Canvas)
Robeson Preservo Co., 401 White Block, Port Huron, Mich.

PAINT (Marine)
American Bitumastic Enamels Co., 17 Battery Place, New York City.
Du Pont De Nemours, E. I., & Co., Wilmington, Del.
International Compositions Co., Inc., 18 Broadway, New York City.
Murphy Varnish Co., Newark, N. J.
Natroco Paint & Varnish Works, Tonawanda, N. Y.

PAINTING EQUIPMENT (Compressed Air and Portable)
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PAINT SPRAYING EQUIPMENT
DeVilbiss Mfg. Co., 1274 Dorr St., Toledo, O.

PANEL BOARDS AND CABINETS
Benjamin Electric Mfg. Co., Chicago, Ill.
Crouse-Hinds Co., Syracuse, N. Y.

PATENTS
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PATTERNS
Wellman Products Co., The, 1444 E. 49th, Cleveland.

PATTERNMAKERS' SUPPLIES
Wellman Products Co., The, 1444 E. 49th, Cleveland

PIG IRON
Carnegie Steel Co., Pittsburgh, Pa.
Hanna, M. A., & Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.

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Refrigeration Engineering Co., Toledo, Ohio.

PIPE FITTINGS (Steel, Iron and Brass)
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Refrigeration Engineering Co., Toledo, Ohio.
United Engineering & Foundry Co., Pittsburgh, Pa.

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Continental Iron Works, West and Calyer, Brooklyn.
Dravo Contracting Co., Engrg. Works Dept., Pittsburgh, Pa.
Larkin, J. K., & Co., New York, N. Y.
Mark Mfg. Co., 1901 Dempster St., Evanston, Ill.

PIPE THREADERS
Curtis & Curtis Co., 525 Garden, Bridgeport, Conn.

PIPE UNIONS
Mark Mfg. Co., 1901 Dempster St., Evanston, Ill.

PIPE VISES
Columbian Hardware Co., Cleveland, Ohio.

PIPE WELDING
Metals & Thermit Corp., 120 Broadway, N. Y. C.

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Commercial Iron & Steel Corp., 115 Broadway, N.Y.

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Dayton Pneu. Tool Co., P. O. Box 1116, Dayton, O.
Independent Pneumatic Tool Co., 600 Jackson Blvd., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
Keller Pneumatic Tool Co., Grand Haven, Mich.
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Shipbuilders Pneumatic Tool Co., Chamber of Commerce Bldg., Portland, Oreg.
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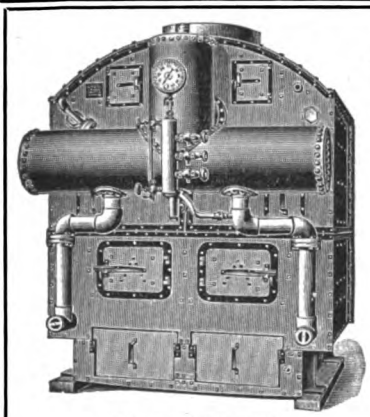

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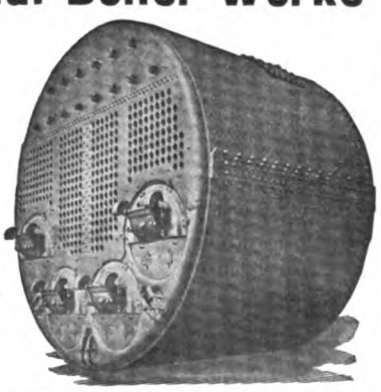

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Detroit Ship Building Co., Detroit, Mich.
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MacKinnon Boiler & Machine Co., Bay City, Mich.
Milwaukee Dry Dock Co., Milwaukee, Wis.
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Toledo Ship Building Co., Toledo, O.
Trout, H. G., Co., Buffalo, N. Y.

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Smart-Turner Machine Co., Ltd., 191 Barton St., Hamilton, Ont., Can.
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Chicago Ship Building Co., So. Chicago, Ill.
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Detroit Ship Building Co., Detroit, Mich.
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Milwaukee Dry Dock Co., Milwaukee, Wis.
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Superior Ship Bldg. Co., Superior, Wis.
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Tietjen & Lang Dry Dock Co., Ft. of 17th St., Hoboken, N. J.
Toledo Ship Bldg. Co., Toledo, O.
Twin City Shipbuilding Co., Benton Harbor, Mich.

RIGGING
Baltimore Dry Dock & Shipbuilding Co., Locust Point, Baltimore, Md.

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Bayonne Bolt & Nut Co., Bayonne, N. J.
Carlin, The, Anthony, Co., Cleveland, O.
Commercial Iron & Steel Corp., 115 Broadway, New York City.
Larkin, J. K., & Co., New York, N. Y.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Severance, S., Mfg. Co., Glassport, Pa.
Stimpson, Edwin B., Brooklyn, N. Y.

RIVETS (Boiler)—See BOILER RIVETS

RIVETS (Ship)
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Liberty Steel Products Co., Woolworth Bldg., New York City.
Severance, S., Mfg. Co., Glassport, Pa.

RIVETS (Structural)
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Ingersoll-Rand Co., 11 Broadway, New York City.
Keller Pneumatic Tool Co., Grand Haven, Mich.
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Skinner & Eddy Corp., Seattle, Wash.

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Chicago Ship Building Co., So. Chicago, Ill.
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Johnston Bros., Ferrysburg, Mich.
Milwaukee Dry Dock Co., Milwaukee, Wis.
Todd Dry Dock, Inc., Harbor Island, Seattle, Wash.
Toledo Ship Building Co., Toledo, O.
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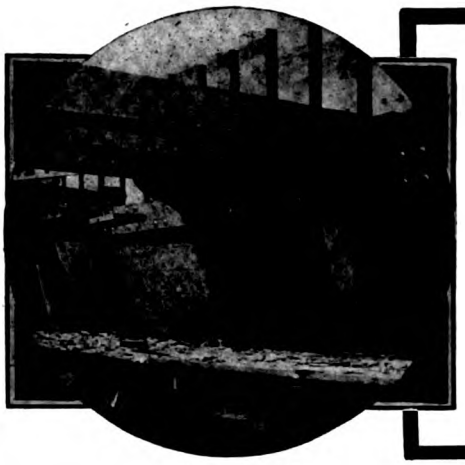

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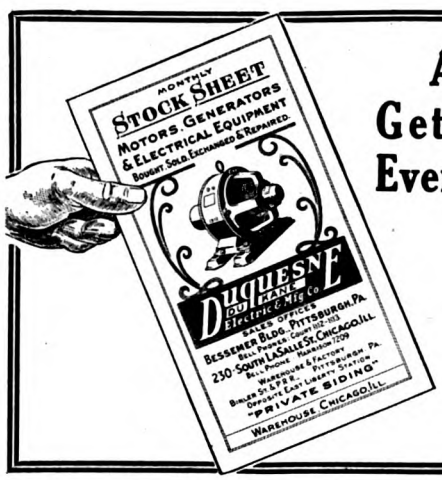

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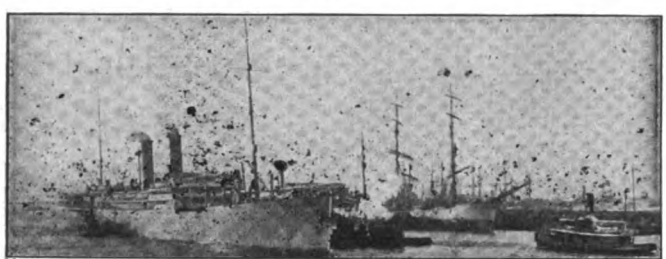

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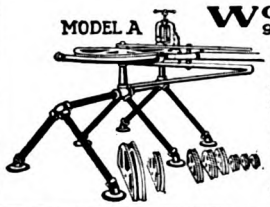

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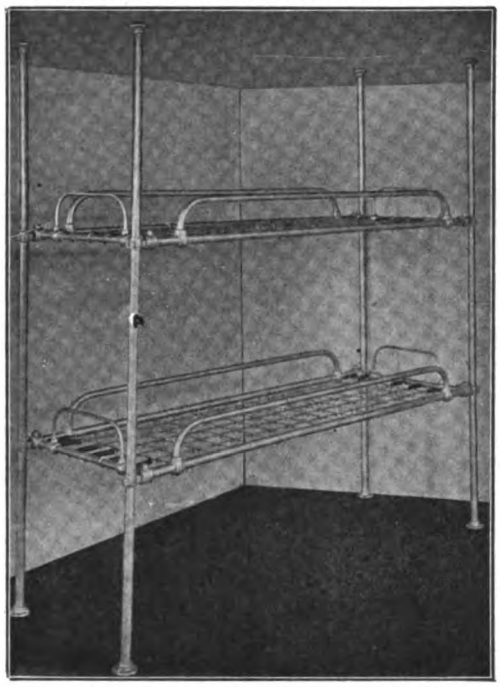

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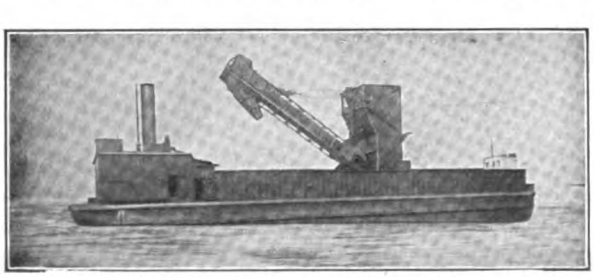

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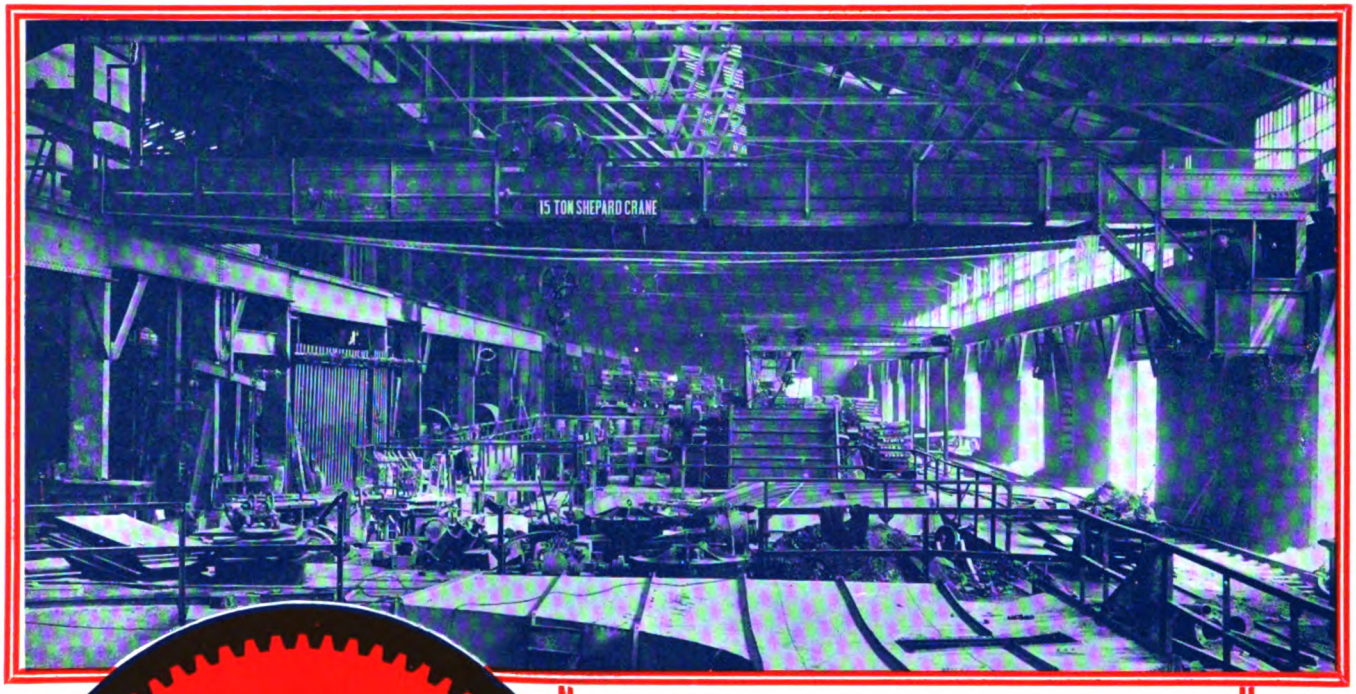

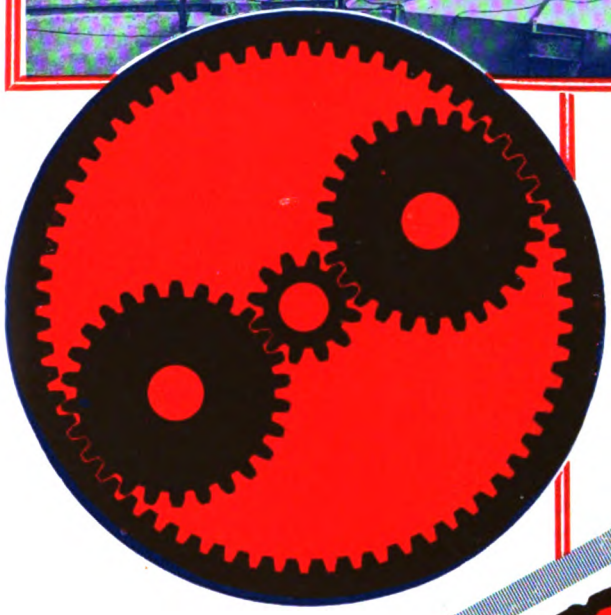

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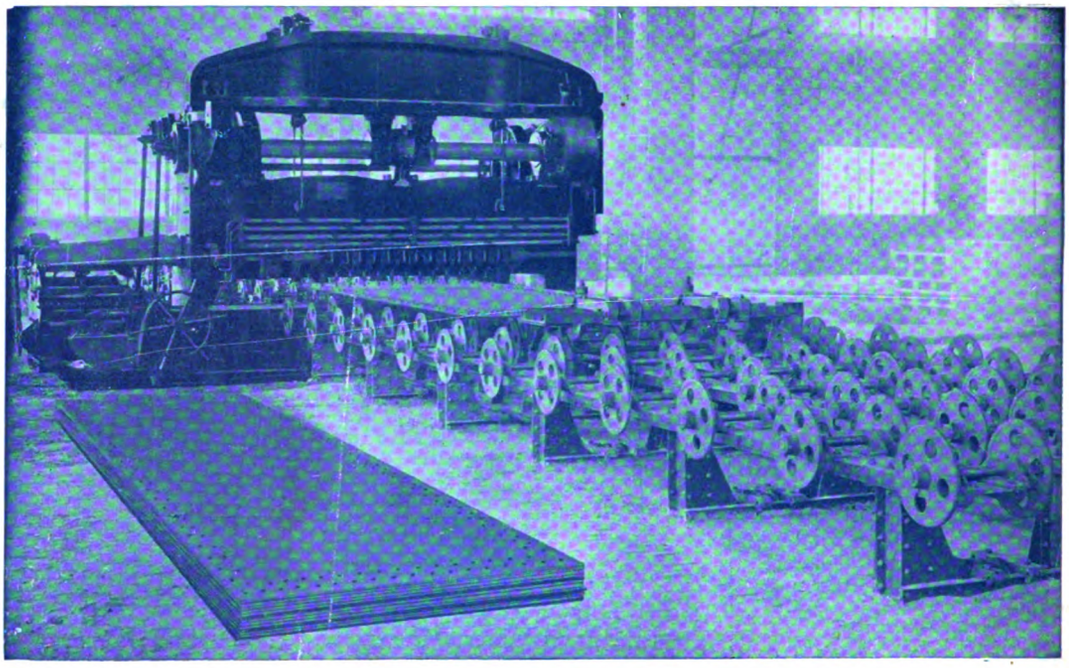

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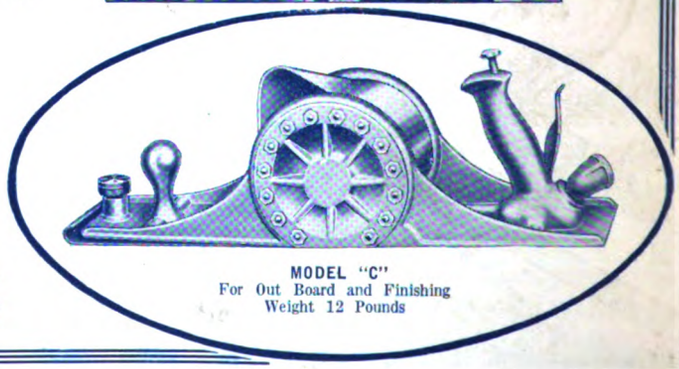

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